

URBAN/MUNICIPAL

CABON HWAOS

98 T34D

DRAFT

TRAFFIC NOISE IMPACT ASSESSMENT

RED HILL CREEK EXPRESSWAY

NORTH-SOUTH SECTION

HAMILTON, ONTARIO

RWDI





REGIONAL MUNICIPALITY OF HAMILTON

AUG 7 1998

ENVIRONMENT DOCUMENTS

DRAFT

TRAFFIC NOISE IMPACT ASSESSMENT RED HILL CREEK EXPRESSWAY NORTH-SOUTH SECTION HAMILTON, ONTARIO

Project Number: 97-207-9

Date: June 12, 1998

Submitted by: Rowan Williams Davies & Irwin Inc.

Project Manager - David S. Chadder, Hon. B.Sc., Q.E.P.

Project Engineer - Darron Chin-Quee, M.B.A., P.Eng.

Project Engineer - Alex P. C. K. S. Lorimer, M.A.Sc., P.Eng.

Project Co-ordinator - Scott L. Penton, B.A.Sc.

Principal - Anton E. Davies, Ph.D, P.Eng., Q.E.P.

Submitted to: Regional Municipality of Hamilton-Wentworth

Companion Studies: Vehicle Air Emissions Inventory

Air Quality Assessment

Thermal Dynamics Assessment

**Rowan Williams
Davies & Irwin Inc.**


Consulting Engineers
650 Woodlawn Road West
Guelph, Ontario
Canada N1K 1B8

Tel: (519) 823-1311

Fax: (519) 823-1316

Email: info@rwdi.com

Website: <http://www.rwdi.com>



Digitized by the Internet Archive
in 2023 with funding from
Hamilton Public Library

<https://archive.org/details/trafficnoiseimpa00hami>

EXECUTIVE SUMMARY

A detailed noise impact assessment of road traffic noise resulting from the Red Hill Creek Expressway North-South section has been performed as part of the Environmental Exemption Order for the expressway.

Existing ambient sound exposures in areas of concern were established through baseline monitoring at a number of locations along the expressway route. Future sound exposures at Noise Sensitive Areas, resulting from the operation of the expressway, were modelled using methods approved by the Ministry of the Environment (MOE) and Ministry of Transportation (MTO), based on information provided by the Regional Municipality of Hamilton-Wentworth.

The change in predicted sound exposure levels between future “build” and “no-build” scenarios was assessed, and used to identify areas where investigation of mitigation was required, in keeping with MOE and MTO protocols. Significant excesses over guideline limits were predicted for most receivers. The effectiveness of various mitigation methods was assessed. Recommended locations and heights for noise barriers, to be located along residential property lines and/or along the expressway right-of-way, were assessed and are provided.

In general, 3 m high property line barriers, composed of berms, noise walls, and or berm/wall combinations, are recommended for most Noise Sensitive Areas. Along the upper part of the expressway (south of Greenhill Avenue) a 4 m high right-of-way barrier along the expressway has been recommended as an option. These measures reduce the impacts at most locations to within 2 dB of the 55 dBA provincial objective. Ambient sound exposures are unusually low for an urban environment at receivers along the mid-section of the expressway route. Predicted mitigated noise levels for these locations, while meeting the 55 dBA requirement, remain up to 11 dB above the ambient. Increasing the barrier height to 4 m at these locations were found to provide only 1-2 dB of additional attenuation, and is therefore not recommended.

TABLE OF CONTENTS

| | Page No. |
|---|----------|
| 1. INTRODUCTION | 1 |
| 1.1 Key Findings | 2 |
| 1.2 Noise Descriptors and Environmental Assessment | 2 |
| 2. GUIDELINES | 3 |
| 2.1 Ministry of Environment and Energy/Ministry of Transportation Guidelines | 3 |
| 2.2 Changes in Sound Exposure | 3 |
| 2.3 Guideline Interpretation | 4 |
| 3. MEASUREMENT PROGRAM | 6 |
| 3.1 Site Selection | 6 |
| 3.2 Equipment and Measurement Techniques | 7 |
| 4. EXISTING SOUND ENVIRONMENT | 9 |
| 4.1 Comparison of 1980 Measurement Results With Existing Conditions ... | 9 |
| 4.2 Ambient Measurement Results | 9 |
| 4.2.1 Long Duration Monitoring | 9 |
| 4.2.2 Short-Duration Monitoring of Green Spaces | 10 |
| 5. IMPACT ASSESSMENT | 12 |
| 5.1 Methodology | 12 |
| 5.1.1 Future “No-Build” Scenario | 12 |
| 5.1.2 Future “Build” Scenario with the Expressway in Place | 12 |
| 5.1.3 Road Traffic Data | 14 |
| 5.2 Projected Sound Exposures | 14 |
| 5.3 Assessment of Impacts | 15 |
| 5.3.1 MTO/MOE Guidelines | 15 |
| 5.3.2 Change in Sound Exposure | 16 |
| 6. MITIGATION | 17 |
| 6.1 Mitigation | 17 |
| 6.1.1 Horizontal Alignment | 17 |
| 6.1.2 Vertical Shifts | 17 |
| 6.1.3 Noise Barriers | 18 |
| 6.2 Mitigation Modelling Results | 18 |
| 6.3 Mitigation Details | 19 |
| 6.3.1 Mainline - Pritchard Road/Mud Street | 19 |
| 6.3.2 Upper Mt. Albion - West of Winterberry | 19 |
| 6.3.3 Tamwood Court | 20 |
| 6.3.4 South of Greenhill Avenue | 20 |
| 6.3.5 North of Greenhill Avenue, East Side of Expressway | 21 |
| 6.3.6 Near CP Rail Line, West Side of Expressway | 21 |

TABLE OF CONTENTS (cont'd)

| | Page No. |
|---|----------|
| 6.3.7 South of King Street, East Side of Expressway | 22 |
| 6.3.8 Lawrence and King Streets, West Side of Expressway | 22 |
| 6.3.9 Between King Street and Queenston Road, West Side of Expressway | 22 |
| 6.3.10 Between King Street and Queenston Road, East Side of Expressway | 23 |
| 6.3.11 Between Queenston Road and Barton Street, East Side of Expressway | 23 |
| 6.3.12 Between Queenston Road and Barton Street, West Side of Expressway | 24 |
| 6.3.13 North of Barton Street, West Side of Expressway | 24 |
| 7. CONCLUSIONS | 25 |
| 8. REFERENCES | 26 |

LIST OF TABLES

| | |
|--------------|--|
| Table 3.1 | Measurement Locations |
| Table 4.1.1 | Differences Between 1980 Measurement Data and Short-Duration Measurement Results |
| Table 4.2.1 | Average Sound Exposures in Each Hour, Site 1 - 239 Upper Mt. Albion Road. |
| Table 4.2.2 | Average Sound Exposures in Each Hour, Site 2 - 10 Tamwood Cr. |
| Table 4.2.3 | Average Sound Exposures in Each Hour, Site 3 - 74 Brookstream Cr. |
| Table 4.2.4 | Average Sound Exposures in Each Hour, Site 4 - 396 Queenston Blvd. |
| Table 4.2.5 | Average Sound Exposures in Each Hour, Site 5 - 12 Armstrong Ave. |
| Table 4.2.6 | Average Sound Exposures in Each Hour, Site 6 - 20 Parklands Dr. |
| Table 4.2.7 | Average Sound Exposures in Each Hour, Site 7 - 32 Jamie Anne Cr. |
| Table 4.2.8 | Average Sound Exposures in Each Hour, Site 8 - 108 Albion Falls Blvd. |
| Table 4.2.9 | Average Sound Exposures in Each Hour, Site 9 - 64 Forest Hill Cr. |
| Table 4.2.10 | Average Sound Exposures in Each Hour, Site 10 - 21 Beland Ct. |
| Table 4.2.11 | Average Sound Exposures in Each Hour, Site 11 - 3 Cherry Road. |
| Table 4.2.12 | Average Sound Exposures in Each Hour, Site 12 - 255 Pottruff Rd. N. |
| Table 4.2.13 | Average Sound Exposures in Each Hour, Site 13 - 350 Pottruff Rd. N. |
| Table 4.2.14 | Average Sound Exposures in Each Hour, Site 14 - 21 Embury Ct. |
| Table 4.2.15 | Average Sound Exposures in Each Hour, Site 15 - 36 Sinclair Rd. |
| Table 4.2.16 | Ambient 24-Hour Equivalent Sound Exposures |
| Table 4.2.17 | Short-Duration Ambient Noise Measurements - Green Spaces |
| Table 5.1.1 | Traffic Data |
| Table 5.2.1 | Projected Sound Levels, SL, for Future Build Scenarios (Unmitigated and Mitigated) |
| Table 5.2.2 | Impact (Change Assessment) With No Mitigation |
| Table 5.2.3 | Impact (Change Assessment) With Mitigation |

-

LIST OF FIGURES

- Figure 1.1 Ambient Noise Measurement Locations, Red Hill Creek Expressway North-South Section
- Figure 4.1.1 Differences Between 1980 Measurement Data and Short-Duration RWDI Measurement Results - Sites 7, 8, and 9
- Figure 4.1.2 Differences Between 1980 Measurement Data and Short-Duration RWDI Measurement Results - Sites 10, 11, and 12
- Figure 4.1.3 Differences Between 1980 Measurement Data and Short-Duration RWDI Measurement Results - Sites 13, 14, and 15
- Figure 4.2.1 Average Sound Exposures in Each Hour, Site 1 - 239 Upper Mt. Albion Road.
- Figure 4.2.2 Average Sound Exposures in Each Hour, Site 2 - 10 Tamwood Cr.
- Figure 4.2.3 Average Sound Exposures in Each Hour, Site 3 - 74 Brookstream Cr.
- Figure 4.2.4 Average Sound Exposures in Each Hour, Site 4 - 396 Queenston Blvd.
- Figure 4.2.5 Average Sound Exposures in Each Hour, Site 5 - 12 Armstrong Ave.
- Figure 4.2.6 Average Sound Exposures in Each Hour, Site 6 - 20 Parklands Dr.
- Figure 4.2.7 Average Sound Exposures in Each Hour, Site 7 - 32 Jamie Anne Cr.
- Figure 4.2.8 Average Sound Exposures in Each Hour, Site 8 - 108 Albion Falls Blvd.
- Figure 4.2.9 Average Sound Exposures in Each Hour, Site 9 - 64 Forest Hill Cr.
- Figure 4.2.10 Average Sound Exposures in Each Hour, Site 10 - 21 Beland Ct.
- Figure 4.2.11 Average Sound Exposures in Each Hour, Site 11 - 3 Cherry Road.
- Figure 4.2.12 Average Sound Exposures in Each Hour, Site 12 - 255 Pottruff Rd. N.
- Figure 4.2.13 Average Sound Exposures in Each Hour, Site 13 - 350 Pottruff Rd. N.
- Figure 4.2.14 Average Sound Exposures in Each Hour, Site 14 - 21 Embury Ct.
- Figure 4.2.15 Average Sound Exposures in Each Hour, Site 15 - 36 Sinclair Rd.
- Figure 5.1 Predicted Noise Impact - Without Mitigation - Pritchard Road to Mount Albion Road
- Figure 5.2 Predicted Noise Impact - Without Mitigation - Mount Albion Road to King Street
- Figure 5.3 Predicted Noise Impact - Without Mitigation - King Street to Barton Street
- Figure 5.4 Predicted Noise Impact - Without Mitigation - Barton Street to QEW
- Figure 5.5 Predicted Noise Impact - With Mitigation - Pritchard Road to Mount Albion Road
- Figure 5.6 Predicted Noise Impact - With Mitigation - Mount Albion Road to King Street
- Figure 5.7 Predicted Noise Impact - With Mitigation - King Street to Barton Street
- Figure 5.8 Predicted Noise Impact - With Mitigation - Barton Street to QEW

APPENDICES

- Appendix A: Commonly Used Noise Descriptors
- Appendix B: Applicable Environmental Noise Guidelines
- Appendix C: Existing Noise Environment
- Appendix D: Excerpts from Appendix C of 1980 Valcoustics Report

1. INTRODUCTION

RWDI was retained by the Transportation Department of the Regional Municipality of Hamilton-Wentworth to carry out a detailed noise impact assessment of road traffic noise to fulfill the conditions of the Environmental Exemption Order for the Red Hill Creek Expressway (RHCE) North-South section. This noise impact study was undertaken in accordance with the study design terms of reference outlined in RWDI Proposal No. 96-469P4 (dated May 21, 1997).

A North-South roadway section is currently being developed, which will link up with the recently completed East-West section. The North-South section will run the length of the Red Hill Creek valley, from Mud Street to the south to the Queen Elizabeth Expressway (QEW) to the north (see Figure 1.1). A number of noise sensitive areas are located on either side of the RHCE route and may be subject to noise effects from construction and operation of the RHCE. The purpose of this study is:

- a) to establish existing ambient sound levels in areas of concern through direct measurement. This data is also used to calibrate numerical noise prediction models to establish existing baseline conditions;
- b) to predict road traffic noise levels resulting from the operation of the RHCE North-South section at receivers of concern, typically the closest residences adjacent to the proposed expressway, using established numerical models. These sound exposures will be compared to applicable provincial guidelines and forecast ambient sound levels to determine areas of potential impact; and
- c) to investigate the feasibility of noise control measures in areas of significant impact. These methods include, but are not limited to, alignment in-cuts, berms, walls and berm/wall combinations.

A protocol for noise monitoring of the RHCE North-South section after construction to determine the impact of sound levels, and a Construction Code of Practice to minimize the impact of noise and vibration emissions are under development and will be presented in a separate report.

A noise impact assessment of the RHCE North-South section was previously completed by Valcoustics Canada Ltd. in 1980 [1]. Sound level data from the original 1980 monitoring program has been used in this analysis, in addition to further site measurements conducted by RWDI.

1.1 Key Findings

The key findings of this study are:

- Predicted sound exposures at Noise Sensitive Areas along the expressway route resulting from expressway operation, exceed Ministry of the Environment (MOE) and Ministry of Transportation (MTO) guidelines concerning noise impacts from new highway development.
- In general, the installation of 3 to 4 m high noise barriers located at or in the proximity of receiver property lines and/or the road right-of-way along much of the expressway route, can reduce noise impacts to the provincial objective of 55 dBA for outdoor areas. However, due to the low measured sound exposures in the area, residual impacts which are based on an assessment of change from existing conditions, are still predicted in many areas.

1.2 Noise Descriptors and Environmental Assessment

It is assumed that the reader is familiar with most common noise descriptors. However, for additional details, an interpretive discussion on noise descriptors is found in Appendix A along with a glossary of the definitions of noise descriptors.

2. GUIDELINES

Appendix B presents excerpts of the applicable environmental noise guidelines which are summarized below.

2.1 Ministry of Environment/Ministry of Transportation Guidelines

The MOE and MTO joint protocol for addressing the noise impact of new or retrofit highway projects indicates that the design “objective for outdoor sound level ($L_{eq}(24)$) is the higher of 55 dBA, or the existing ambient” sound exposure without the undertaking, as being desirable [2]. The protocol is general and does not distinguish between urban and suburban settings. It indicates that increases of up to 5 dB above the existing ambient level do not require mitigation. Increases of more than 5 dB require an investigation for implementing mitigation within the road right-of-way. However, mitigation is warranted only if the measures used are capable of producing a 5 dB or more reduction in sound exposure, and project costs are not significantly affected. Measures which produce less than 5 dB attenuation at the first row of receivers are not considered to be cost effective.

MTO document Directive QST A-1, “Noise Policy and Acoustic Standards for Provincial Highways” also outlines requirements consistent with the MOE/MTO joint protocol, but also states that “noise control measures where applied . . . will be designed to achieve levels as close to or lower than the objective level of 55 dBA ($L_{eq}(24)$) or pre-construction ambient as is technically, economically, or administratively feasible” [3].

2.2 Changes in Sound Exposure

Based on general practice, increases (or decreases) in sound exposure can be ranked as follows:

- | | | |
|----|---------------|---|
| a) | 3 dB or less | - considered insignificant due to imperceptibility; |
| b) | 4 to 5 dB | - considered a just-noticeable difference; |
| c) | 6 to 9 dB | - considered marginally significant; and |
| d) | 10 dB or more | - significant, perceived as a doubling (halving) of sound exposure. |

Please note that differences in A-weighted decibels, “dBA”, should, by definition, be reported in decibels, “dB”, and that this convention has been used in this report.

2.3 Guideline Interpretation

As indicated in Section 2.2, changes of 4 to 5 dB are just-noticeable. This human response to changes in noise forms the basis of the MTO/MOE protocol cutoff of 5 dB where mitigation would be investigated.

The intent of mitigation is to minimize changes to the existing sound environment. Therefore, mitigation should always attempt to reduce impacts to as close to the pre-construction ambient level as possible [4]. However, under certain circumstances, this goal cannot be achieved due to limitations imposed on practical noise barrier heights and hence, the level of attenuation that is possible. In general, most barrier configurations are capable of a maximum of about 15 to 20 dB of attenuation.

Thus, in the case of a receiver with a pre-construction ambient level of 45 dBA, the objective is to maintain this 45 dBA level. However, where technical and/or economic concerns make this not feasible, mitigation should attempt to achieve at least 55 dBA, the provincial objective, which is generally considered an acceptable environment for outdoor space.

The 55 dBA objective is based on numerous sociological studies, and is prescribed in U. S. Environmental Protection Agency (U.S. EPA) documentation as a level which “protects the vast majority of the population against long-term annoyance of noise” with an adequate margin of safety [5]. While many populations, particularly in an urban setting, tolerate higher sound exposure levels, the greater the excess over 55 dBA, the greater the likelihood of annoyance. It is for this reason that the MTO guideline document QST-A1 also advocates that if mitigation is warranted, that such mitigation be designed where feasible to mitigate to 55 dBA or the existing ambient.

Thus, for a pre-construction ambient level of 60 dBA, the objective would be to mitigate post-construction levels to 60 dBA, resulting in little change to the existing environment. Nonetheless, if readily achievable from a cost and technical feasibility perspective, noise control measures used to address the new highway noise impact should attempt to reduce overall sound levels to 55 dBA under QST-A1 guidelines.

3. MEASUREMENT PROGRAM

3.1 Site Selection

Long-duration measurements of ambient sound levels (i.e., measurements of hourly sound exposures over a period of 24 hours or greater) in the area of the RHCE were previously obtained by Valcoustics for the 1980 impact report [1]. Nine of these measurement sites (Sites 7 through 15) are located in areas that will be potentially affected by the RHCE North-South section, with the remainder addressing the East-West portion of the expressway. This data has been used for the purposes of this assessment. To remain consistent with the previous impact report, the Valcoustics site numbering has been retained. In addition to these sites, long duration monitoring was performed at six new receiver locations by RWDI (listed as Sites 1 through 6 in this report).

The sample locations were selected to provide representative worst-case sound exposures in the residential areas located along the Red Hill Creek ravine. The measurements were taken in the outdoor living areas (usually the backyard) of houses located adjacent to the creek ravine or floodplain. Residences with small children, swimming pools, and pets were avoided, due to the potential for the generation of extraneous noise. Site security, both to protect the monitor from vandalism and reduce extraneous noise caused by close examination of the monitor by pedestrians, was of utmost importance. Inconspicuous locations in fenced-in backyard areas were typically selected.

Long-duration monitoring was not conducted in park spaces along the RHCE route, due to concerns over site security and the increased probability of spurious measurement data that does not reflect the true ambient level in the area. Although park spaces are not considered noise sensitive areas for the purposes of MTO guidelines, short-duration (one hour sound exposure) measurements were taken at a number of green space (park) sites (Sites A through M in Figure 1.1).

Table 3.1 provides the locations of the long-term measurement sites (1980 and 1997 studies) along the RHCE route. Measurement locations are also shown on Figure 1.1.

3.2 Equipment and Measurement Techniques

Measurements at all locations were obtained using a Larson-Davis Model 820 Precision Integrating Sound Level Meter (SLM). The Model 820 unit uses a Larson-Davis Model 2560 precision air-condenser microphone and a Larson-Davis Model 828 preamplifier, which have been factory calibrated with the SLM unit. Pre- and post-measurement calibration was checked using a Larson-Davis Model CA250 precision acoustic calibrator.

All measurements were conducted in accordance with MOE NPC-103 measurement guidelines [6]. MOE NPC-103 guidelines specify the acceptable techniques for sound measurements including:

- a) types of equipment;
- b) minimum duration of measurements;
- c) microphone positions;
- d) calibration procedures and instrument checks; and
- e) weather conditions.

Short-term measurements of at least 20 minutes duration (acceptable to the MOE as being equivalent to 1-hour sound exposure measurements) were taken at the 1980 assessment sites to determine whether the sound environment at these locations has significantly changed during the intervening years. Comparisons between the 1980 measurement data and the short-duration data were made for four parameters: $L_{eq}(1)$, L_{10} , L_{50} , and L_{90} (the energy equivalent sound exposure and noise level exceeded 10%, 50%, and 90% of the time, respectively). For the purposes of this assessment, significant differences are defined to be differences greater than 5 dB, accounting for instrument measurement tolerances and daily variability.

Long-duration measurements (hourly sound exposures over a period of at least 24 hours) were taken by RWDI at six new sites along the RHCE route and at three of the 1980 sites which were found to have significant differences based on the short-term measurements. Measured noise

statistics included $L_{eq}(1)$, L_{min} (minimum measured sound level), L_{max} (maximum measured sound level) and L_n statistics.

Short-term measurements of at least 20 minutes duration (acceptable to the MOE as being equivalent to 1-hour sound exposure measurements) were taken at 13 sites (Sites A through M in Figure 1.1), representing green spaces (parks and recreation trails) and community uses (community centres, golf courses, etc.).

4. EXISTING SOUND ENVIRONMENT

Full results from the current monitoring program as well as excerpts from the earlier 1980 report are presented in Appendices C and D, respectively.

4.1 Comparison of 1980 Measurement Results With Existing Conditions

Based on comparisons between the 1980 measurement data and the short-duration data, significant differences were obtained at Sites 12 and 14. Long-duration monitoring was repeated by RWDI at these two sites.

Potentially significant differences were obtained for Sites 11 and 15. In both cases, the $L_{eq}(1)$ values of the 1980 measurements were 8 dB higher than the corresponding short-duration RWDI measurements. Since the other noise parameters were not significantly different, the variation was likely due to some high level transient event captured in the 1980 measurements, but not present in the 1997 data. For the case of Site 15, the 1980 $L_{eq}(24)$ values are below 55 dBA, which means that the MOE/MTO minimum guideline level would apply. Based on this, it was decided not to re-measure this site. Long-duration monitoring was repeated by RWDI at Site 11.

Table 4.1.1 summarizes the results of the comparisons between the 1980 measurement data and the short-duration measurements. These results are shown graphically in Figures 4.1.1 to 4.1.3.

4.2 Ambient Measurement Results

4.2.1 Long Duration Monitoring

Long-duration measurements conducted by RWDI as part of this study range from approximately 1.5 to 6 days in duration (the 6-day duration was required at one site due to increased spurious data resulting from the August Civic Holiday). Average sound levels ($L_{eq}(1)$ and L_n values) for each hour of the day were calculated by arithmetically averaging the measured hourly sound levels obtained over the entire measurement duration. Spurious data resulting from high intensity

transient noise sources, such as lawnmowers or other human activity not normally reflected in the ambient were excluded from the calculation. However, the full measurement results from the RWDI survey, including spurious data, are presented in Appendix C. Tables 4.2.1 to 4.2.15 and Figures 4.2.1 to 4.2.15 present the average distributions (which exclude spurious data). Again, results presented for Sites 1 through 6, 11, 12 and 14 represent data obtained by RWDI. Data presented for Sites 7 through 10, 13 and 15 provide 1980 survey results.

$L_{eq}(24)$ values for each site were calculated based on the average hourly sound exposure distributions. Again, spurious data resulting from high intensity transient noise sources, such as lawnmowers or other human activity not normally reflected in the ambient were excluded from the calculation. Table 4.2.16 summarizes the measured $L_{eq}(24)$ values at the measurement locations along the RHCE route. Measured $L_{eq}(24)$ values range from 47 dBA to 62 dBA, depending on location. The highest sound levels were found on Embury Ct., which is reflective of industrial and railway activity in the area; whereas, the lowest sound levels were found on Jamie Anne Crescent, which is adjacent to existing valley lands.

Sites with sound exposures below 50 dBA are influenced primarily by the sounds of nature while those sites with sound exposures above 50 dBA are generally influenced by urban noise, primarily road traffic. Higher sound exposure levels (greater than 55 dBA) generally indicate a greater influence of road traffic or industrial noise.

4.2.2 Short-Duration Monitoring of Green Spaces

Short-term measurements of at least 20 minutes duration (acceptable to the MOE as being equivalent to 1 hour sound exposure measurements) were taken at Sites A through M. As presented in Table 4.2.17, measurement results range from 45 to 70 dBA. As with the long-duration measurements, sites with sound exposures below 50 dBA are influenced primarily by the sounds of nature while those sites with sound exposures above 50 dBA are generally influenced by urban noise, primarily road traffic. Higher sound exposure levels (greater than 55 dBA) generally indicate a greater influence of road traffic or industrial noise. The highest ambient noise levels were found at the Lakeland Community Centre and Confederation Park. Sound levels were dominated by road

traffic noise from the QEW at these two sites. The lowest ambient levels were measured at Greenhill Bowl Park.

5. IMPACT ASSESSMENT

5.1 Methodology

As per MTO QST-A1 requirements, potential noise impacts from post-construction operation of the RHCE were studied for a design year of 2012, estimated as being at least 10 years in the future from the completion of the expressway.

The receivers of concern for this analysis, in keeping with MTO and MOE guidelines, are the first row of houses adjacent to the RHCE, along the length of the expressway route.

5.1.1 Future “No-Build” Scenario

Traffic projections for the future “no-build” scenario were not available. In the absence of construction of the expressway, sound exposures at most receivers of concern would not be expected to increase significantly from current levels, as most areas are already fully developed. Therefore, as a conservative assumption, current ambient sound exposures, as measured during the measurement program and unadjusted for traffic growth, have been used to approximate the future “no-build” condition for the purposes of impact assessment. Where ambient measurements location were sufficiently removed from a receiver location, the future “no-build” condition was estimated by modelling the current road traffic

5.1.2 Future “Build” Scenario With the Expressway in Place

General Methods

Sound exposures at noise sensitive areas (NSAs) of concern were modelled using the MOE’s Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) model and STAMSON v5.0, a computerized version of the ORNAMENT model [7][8]. NSAs were modelled as points along defined line receivers, as shown in Figures 5.1 to 5.4.

ORNAMENT models roadway segments as “line” sources of sound. Reference 24-hour equivalent sound exposures ($L_{eq}(24)$) resulting from road traffic noise are calculated considering:

- a) traffic volumes along roadway links;
- b) traffic distribution (percentage medium and heavy trucks);
- c) posted speed limits; and
- d) road gradients.

Sound exposures at finite points along the defined receiver lines were then calculated, accounting for:

- a) roadway-receiver geometry;
- b) distance attenuation;
- c) ground absorption where applicable; and
- d) barrier effects from existing topography and/or man-made features.

The noise contribution from the main line of the RHCE, as well as from on and off ramps and other arterial roadways in the vicinity of receivers, were calculated. Unmitigated and mitigated sound exposures were calculated for a range of barrier heights.

Mitigation

Various mitigation methods are available, including:

- a) horizontal and vertical realignments of the highway; and
- b) installation of noise barriers, which can be in the form of berms, noise walls, and/or berm/wall combinations.

Horizontal and vertical realignments of the highway are generally not feasible at this stage, due to constraints placed on the alignment by the stream re-channelization and hydrogeological requirements. In addition, the impacts of these mitigation methods are expected to be minor in general, given the elevated nature of most of the receivers and the setback distances involved. Therefore, these mitigation techniques have not been examined in detail. The effect of noise barriers located along residential property lines and/or the expressway right-of-way has been examined in detail, using an iterative process to determine barrier effectiveness.

5.1.3 Road Traffic Data

Future traffic predictions for the design Year 2012 were not available. As a conservatism, road traffic data in the form of Annual Average Daily Traffic (AADT) volume predictions and percent truck breakdowns were provided by the Regional Municipality of Hamilton-Wentworth, for the Year 2021 (Vision 2021 data) [9]. This data is summarized in Table 5.1.1.

5.2 Projected Sound Exposures

Predicted unmitigated and mitigated sound exposures as well as an indication of the ranges of impacts are provided in Table 5.2.1 and in Figures 5.1 to 5.8.

Consistent with MTO QST-A1 guidelines and standard practice for change assessment, increases in sound exposure at the NSA's have been ranked as follows for comparison of alternatives and assessment purposes:

- a) 0.0 to 5.0 dB;
- b) 5.1 to 10.0 dB;
- c) 10.1 to 15.0 dB; and
- d) >15.1 dB.

The results of these rankings for each of the receiver segments are shown in Table 5.2.2 for predicted sound exposures with no mitigation and in Table 5.2.3 for predicted sound exposures with mitigation. These predicted zones of unmitigated impacts are shown in Figures 5.1 to 5.4, and mitigated impacts in Figures 5.4 to 5.8.

As noted earlier, differences in A-weighted decibels, “dBA”, should, by definition, be reported in decibels, “dB”, and this convention has been used in this report.

5.3 Assessment Of Impacts

5.3.1 MTO/MOE Guidelines

In general, significant impacts are predicted along much of the expressway route. Unmitigated sound exposures resulting from the operation of the RHCE will be higher than the provincial objective of 55 dBA at most receivers. Measured ambient sound exposures ranges from 47 dBA to 62 dBA, depending on location. Sound exposures of up to 68 dBA resulting from the operation of the RHCE are predicted at some receivers. Unmitigated changes in predicted sound exposure (future “build” versus “no-build”) range from 0 to 20 dB.

Most of the potential high-impact areas (i.e., areas with impacts greater than 5 dB) occur in the mid-section of the expressway section, in the area around and between the Greenhill Avenue and Queenston Road intersections, due to a combination of lower existing ambient sound exposure levels (below the provincial objective of 55 dBA) and higher projected future sound exposures due to level topography and reduced screening from topographical features. Ambient sound exposures at receivers to the north are higher (greater than the provincial 55 dBA objective), due to the increased influence of noise from the QEW, industrial activity, and other existing noise sources.

5.3.2 Change in Sound Exposure

Unmitigated changes in predicted sound exposure (future “build” versus “no-build”) range from 0 to 20 dB. It is important to note that community response to noise is based more on change from existing conditions rather than on an absolute value. While 55 dBA is the provincial objective for outdoor living areas, representing a reasonable sound exposure in an urban environment, ambient sound exposures in many areas along the expressway route are much lower. Thus, there is the potential for residual impacts (i.e., changes in sound exposure greater than 5 dB) and community response in some areas where the 55 dBA objective will be met with the RHCE in place.

6. MITIGATION

6.1 Mitigation Approaches

6.1.1 Horizontal Alignment

Horizontal alignment of the roadway affects the distance separation between the source of noise (i.e., expressway traffic) and the receiver (i.e., someone's home). In general, noise from a highway increases at a rate of 3 to 5 dB for each halving of source-receiver distance and decreases at the same rate for each doubling of distance. The distance attenuation rate is dependant on the ground absorption with a range of 3 to 5 dB per doubling (halving) of distance, which is applicable for most conditions. Thus, assuming an initial setback from the highway of 100 m, a change in alignment of 50 m closer to any receiver would increase sound exposures by 3 to 5 dB, and an alignment change of 100 m farther from any receiver would decrease sound exposures by 3 to 5 dB. Assuming ideal conditions, minor changes in the expressway alignment (i.e., up to 15% of the existing separation distance) would result in an expected maximum change of about 1 dB.

Because of the large changes in alignment required to produce significant mitigation results, and because of the restraints place on horizontal realignment due to the stream re-channelization, this mitigation method is not practical for most NSAs, and therefore has not been investigated further.

6.1.2 Vertical Shifts

Vertical shifts in the roadway alignment have the potential to reduce noise levels to a greater extent than changes in the horizontal alignment. The effectiveness of a noise barrier, whether as part of specific mitigation measures incorporated into the highway design, or as inherent topographical features (e.g., highway in-cut), is determined by the extent to which the line of sight between highway and receiver is broken. In some cases, minor differences in elevation of 1 m can result in large changes in noise attenuation provided by a barrier. However, due to restraints placed on grade changes because of other design concerns, this mitigation method has not been investigated further.

Vertical alignments which affect grades, also affect the noise generated, particularly by heavy trucks using low gears. However, for the range of grades (<1% to 4% grade) and volume of heavy truck traffic (10% of total volume) anticipated, the difference due to grade is expected to be insignificant for the RHCE main line and less than 1 dB.

6.1.3 Noise Barriers

Noise barriers, in the form of berms, noise walls, and/or berm/wall combinations can be used to significantly reduce noise impacts at many NSAs along the expressway route. As a minimum, a noise barrier must break the line-of-site between a source and receiver to be effective. A 5 dB attenuation of noise levels from that source will result where a barrier is at grazing incidence to the line of site (i.e., the top of the barrier just breaks the line-of-site). Higher values of attenuation can be achieved with higher barriers. However, higher barriers have diminishing rates of improvement with increased height. For most locations along the expressway route, improvements in noise attenuation provided by a barrier decrease rapidly beyond a height of 3 to 4 m.

6.2 Mitigation Modelling Results

The effect of noise barriers was investigated at or near the property line of NSAs and/or at the road right-of-way. Table 5.2.1 indicates resulting mitigated sound exposures at receivers with barriers in place. The maximum predicted sound exposure with barriers in place is 61 dBA (which achieves the current ambient sound exposure level). Excesses over ambient sound exposures range from 0 to 11 dB accounting for recommended barrier configurations, versus unmitigated changes, which range from 0 to 20 dB.

The effectiveness of barriers at individual NSAs is discussed in more detail in Section 6.3. Please note that “property line” barriers may not be located exactly at the property line of a receiver, depending on the local topography. For example, for an elevated receiver located near a canyon edge of the valley, whose property line extends into the ravine, the barrier should ideally be located at the top edge of the canyon for most effective mitigation.

6.3 Mitigation Details

The following discussion provided details with respect to proposed mitigation for the receiver segments along the Red Hill Creek Expressway North-South section. The segments are grouped into zones of similar mitigation requirements, topography, etc. The details pertaining to the proposed mitigation of each zone is presented. As discussed above, the mitigation design attempts to reduce the noise levels to meet the ambient sound level if practical (i.e., generally with a limiting height of 3 m for property line barriers and 4 m for expressway right-of-way barriers), recognizing that 55 dBA represents a reasonable threshold of acceptability (see Section 2.3 for details). In some cases, levels remain in excess of the criteria after the proposed mitigation measures have been installed.

6.3.1 Mainline - Pritchard Road/Mud Street (Segments S1-L4, L5)

A 5 m high barrier erected along the north side of the highway right-of-way west of Pritchard Road should provide the attenuation required to reduce the noise levels at the S1-L4 receivers to within 2 dB of the 55 dBA criterion noise level. Alternatively, a 3 m property line barrier should achieve a slightly higher noise level of 59 dBA. Either of the above mitigation scenarios includes a 5 m high highway right-of-way barrier on the north side of the expressway from the east side of Pritchard Road tapering down to 3 m high at the ramp N-E/ramp E-W/ramp N-S overpasses. In addition, a 2 m high roadside barrier on the west side of the N-E ramp is required to similarly reduce noise levels at point “S” of S1-L5. Due to the low ambient noise levels in this area, the mitigated noise levels remain approximately 5 dB (or 7 dB for the alternative scenario) above the ambient sound level, which is generally considered to be just-noticeable (or a minor excess for the alternative scenario). Higher barriers render diminished improvements in attenuation and become difficult to construct and maintain.

6.3.2 Upper Mt. Albion - West of Winterberry (Segments S1-L1, L2)

A 2 m high barrier erected along the north side of ramp E-N should attenuate the noise levels for the S1-L1 receiver locations to within the 55 dBA criterion noise level and to within 1 dB of the ambient. Alternatively, a 2.5 m property-line barrier could reduce the noise levels at this location

to meet 55 dBA, remaining 3 dB above the ambient. This residual excess is considered a negligible impact.

A 3 m high barrier erected along the south side of ramp N-E/W-E (Mud Street Diversion) should attenuate noise levels for the S1-L2 receiver locations to within 1 dB of the 55 dBA criterion noise level, remaining 4 dB above the ambient. This residual excess is considered to be barely noticeable and higher barriers will render diminished improvements in attenuation.

6.3.3 Tamwood Court (Segment S1-L6)

No mitigation measures are required for these receiver locations to maintain noise levels at the ambient level.

6.3.4 South of Greenhill Avenue (Segments S4-L1, L2, L3, S5-L1, L2)

A 4 m high barrier erected along the highway right-of-way will provide the attenuation required to reduce the noise levels at these receivers to meet the 55 dBA criterion noise level. Alternatively, a 3 m property line barrier will achieve similar noise levels. Either mitigation scenario includes a 3 m property line barrier along Greenhill Avenue, tapering down to 2.4 m at point “E” of segment S5-L2. Due to the low ambient noise levels in this area, the mitigated noise levels remain 7 to 11 dB above the ambient sound level, which is considered to be marginally significant to significant increases. Higher barriers render diminished improvements in attenuation and become difficult to construct and maintain.

While the playing field does not require mitigation under the guidelines, a roadway right-of-way barrier would provide noise reduction for the playground (segment S4-L2) as well as maintaining a sight-line from the residences to the playground, which may address some safety concerns. Since a property line barrier is required along Greenhill, for barrier effectiveness at point “E” of segment S5-L3 and “S” of segment S5-L4, it should be continuous or overlap with the Red Hill Creek Expressway barrier, whether it is a right-of-way barrier or a property line barrier.

6.3.5 North of Greenhill Avenue, East Side of Expressway (Segments S5-L3, L4, L5, L6)

A 3 m high property line barrier erected along segment L4, and tapering down to 2.4 m at points “S” along L3 and L5 will reduce the predicted noise levels to below 55 dBA. Due to the low ambient noise in this area, the mitigated noise levels remain 2 to 10 dB above the ambient, considered to be insignificant to significant increases in sound exposure. Higher barriers render diminished improvements in attenuation and become difficult to construct and maintain.

While the playing field does not require mitigation under the guidelines, a 3 m high schoolyard property line barrier would provide noise reduction for the playground (segment S5-L6) improving speech communication in the area.

6.3.6 Near CP Rail Line, West Side of Expressway (Segments S5-L9, L10, S6-L5, R12)

The recommended mitigation includes a 3 m high property line barrier along segment S5-L10, S6-L5 and R12, connecting between points “S” of S5-L10 and S6-L5, and tapering down to 2.4 m at point “S” along segment S5-L9. This will reduce the noise levels to meet the 55 dBA provincial objective. Noise levels will exceed the ambient by only up to 3 dB, considered to be an insignificant and imperceptible increase. Higher barriers render diminished improvements in attenuation, become difficult to construct and maintain, and do not address the noise from other nearby noise contributors (e.g., King Street, Lawrence, Road, CP Rail Line).

The detailed design of the segment connecting between segments S5-L10 and S6-L5 should be arranged so as to provide shielding from the expressway for all residences along that exposure. This may include combinations of bends in the segment, overlapping shielding where the segment crosses the railway line, et cetera. However, the barrier should preferably remain within 10 to 20 m of the residential property lines to maintain effective attenuation.

6.3.7 South of King Street, East Side of Expressway (Segments S5-L7, L8, S6-L1, L3)

A 3 m high property line barrier along segments S5-L7 and L8 will reduce noise levels to meet both the 55 dBA criterion and the ambient, except for points “S” of segment S5-L8 and segment S6-L1 which exceed 55 dBA by 1-2 dB (considered to marginally meet the criterion) and point “E” of segment S6-L3 which exceeds 55 dBA by 4 dB (considered a minor excess). Due to the low ambient noise in this area, the mitigated noise levels at these points remain up to 9 dB above the ambient, considered to be a significant increase. Higher barriers render diminished improvements in attenuation, become difficult to construct and maintain, and do not address the noise from other nearby road noise contributors (e.g., Mount Albion Road, King Street, etc.).

The detailed design of the segment connecting between segments S5-L8 and segment S6-L1 should be arranged so as to provide shielding from the expressway for all residences along that exposure. This may include combinations of bends in the segment, overlapping shielding where the segment crosses the railway line, et cetera. However, the barrier should preferably remain within 10 to 20 m of the residential property lines to maintain effective attenuation.

6.3.8 Lawrence and King Streets, West Side of Expressway (Segment R14)

A 2 m high barrier along this segment with a proper return at point “S” will reduce the noise levels to below 55 dBA and to marginally meet the ambient noise level (within 3 dB), which is generally considered to be an imperceptible and insignificant increase.

6.3.9 Between King Street and Queenston Road, West Side of Expressway (Segments S6-L6, S7-L1)

A 3 m property line barrier along these segments with a proper return-end at point “S” of S6-L6 will reduce noise levels to meet the criterion level of 55 dBA, except for a marginal (2 dB) excess at point “S” of S7-L1. These levels are also within 1 dB of the ambient, except at point “S” of S7-L1 where the excess is 5 dB, a just-noticeable increase. A higher barrier will render diminished

improvement in attenuation, become difficult to construct and maintain, and does not address the noise from other nearby road noise contributors.

6.3.10 Between King Street and Queenston Road, East Side of Expressway (Segments S6-L7, L8, S7-L2, L3)

A 3 m high property line barrier along segments S6-L7, L8, S7-L2, L3 results in noise levels which meet the 55 dBA criterion, except for along S6-L7 where there is a 2-4 dB excess (considered marginal to minor). Also, the resulting noise levels are within 1 dB of the ambient, again except along S6-L7 where the excess is 5-7 dB (considered to be a just-noticeable to marginally significant increase). However, because of the direct line of sight to the expressway from these locations along the edge of the valley, a higher barrier will render diminished improvement in attenuation, as well as be difficult to construct and maintain, and does not address the noise from other nearby road noise contributors (e.g., King Street, Queenston Road, Pottruff Road).

6.3.11 Between Queenston Road and Barton Street, East Side of Expressway (Segments S7-L4, L5, S8-L1, L2)

A 3 m high property line barrier along segments S7-L5, S8-L1, L2 will reduce noise levels to within 2 dB of the 55 dBA criterion. The ambient is exceeded by 5 to 6 dB, notably where the receivers are very close to the expressway. This is considered to be a just-noticeable to marginally significant increase. However, because of the direct line of sight to the expressway from these locations along the edge of the valley, a higher barrier will render diminished improvement in attenuation, as well as be difficult to construct and maintain, and does not address the noise from other nearby road noise contributors (e.g., Queenston Road, Barton Street, Pottruff Road).

Along segment S7-L4, the sound environment is currently dominated by road traffic on Pottruff Road. As the predicted future build noise levels are only 1 dB higher than that ambient, which is considered insignificant, no mitigation is required. The noise levels remain 9-10 dB above the 55 dBA criterion. As the noise source is Pottruff Road, barriers along the edge of the valley will not render an improvement.

6.3.12 Between Queenston Road and Barton Street, West Side of Expressway (Segments S7-L6, L7, S8-L4, R52)

A 3 m high property line barrier with proper returns and extensions along segments S7-L6, L7, along the property lines with direct exposure to the expressway near point “E” of segment S8-L4, and R52 will reduce the noise levels to within 3 dB of the 55 dBA criterion. The ambient will be exceeded by 5 to 10 dB along segments S7-L6, L7, considered to be just-noticeable to significant increases, and 4 dB near point “S” of S8-L4 (where no mitigation is recommended), considered to be a just-noticeable increase. However, because of the direct line of sight to the expressway from these locations along the edge of the valley, a higher barrier will render diminished improvement in attenuation, as well as be difficult to construct and maintain, and does not address the noise from other nearby road noise contributors (e.g., Queenston Road, Barton Street).

6.3.13 North of Barton Street, West Side of Expressway (Segments R54, S8-L3)

A 3 m high property line barrier from point “E” of segment R54 tapering down to 2.4 m at point “S” of segment R54, and tapering further down to 2 m at point “E” of S8-L3 will reduce noise levels to that of the ambient, while remaining 4 to 6 dB in excess of the 55 dBA criterion. Higher barriers will render diminished improvement in attenuation of expressway noise and may have no noticeable effect because of the high ambient noise levels.

7. CONCLUSIONS

RWDI has assessed the noise impact of the proposed Red Hill Creek Expressway in accordance with Ontario Ministry of Transportation and Ministry of Environment guidelines.

Measurements of the existing ambient noise levels were used to determine the existing sound environment. Traffic data and geometric/topographic information for the proposed expressway and surrounding area as obtained from the Regional Municipality of Hamilton-Wentworth were used as input to MOE's ORNAMENT and STAMSON noise prediction models, used to predict future noise levels from the expressway.

Predicted impacts exceeded both the 55 dBA provincial objective and measured ambient sound exposures. Therefore, investigation of mitigation was required and the effectiveness of various mitigation methods, including noise barriers, was assessed.

In general, 3 m high property line barriers, composed of berms, noise walls, and or berm/wall combinations, are recommended for most Noise Sensitive Areas. Along the upper part of the expressway (south of Greenhill Avenue) a 4 m high right-of-way barrier along the expressway has been recommended as an option. These measures reduce the impacts at most locations to within 2 dB of the 55 dBA provincial objective.

Ambient sound exposures are unusually low for an urban environment at receivers along the mid-section of the expressway route. Predicted mitigated noise levels for these locations, while meeting the 55 dBA requirement, remain up to 11 dB above the ambient. Increasing the barrier height to 4 m at these locations were found to provide only 1-2 dB of additional attenuation, and is therefore not recommended.

8. REFERENCES

- [1] Valcoustics Canada Ltd, Noise Impact Assessment Regarding Mountain East/West and North/South Transportation Section, October 1980.
- [2] Ontario Ministry of Transportation, Environmental Office Manual - Technical Areas - Noise, May 1992.
- [3] Ontario Ministry of Transportation, Ministry Directive QST A-1, *Noise Policy and Acoustic Standards for Provincial Highways*, February 21, 1992.
- [4] Personal conversation between Mr. Chris Blaney, Ministry of Transportation, and Mr. Darron Chin-Quee, RWDI, April 9, 1998.
- [5] United States Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety, dated March 1974.
- [6] Ontario Ministry of Environment, Model Municipal Control By-law - Final Report, Publication NPC-103: Procedures, August 1978.
- [7] Ontario Ministry of Environment, Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), dated November 1988.
- [8] Ontario Ministry of Environment, Noise Assessment and Systems Support Unit, STAMSON Version 5.0, September 1990
- [9] Meeting with John Van der Mark and Chris Murray, Regional Municipality of Hamilton-Wentworth, with RWDI personnel, January 16, 1998.

APPENDICES

FIGURES

TABLES

Table 3.1 Measurement Locations [1]

| Site No. | Site Location |
|----------|-------------------------------|
| 1 | 239 Upper Mt. Albion Rd. |
| 2 | 10 Tamwood Cr. |
| 3 | 74 Brookstream Ct. |
| 4 | 396 Queenston Blvd |
| 5 | 12 Armstrong Ave. |
| 6 | 20 Parklands Drive. |
| 7 | <i>32 Jamie Anne Cr.</i> |
| 8 | <i>108 Albion Falls Blvd.</i> |
| 9 | <i>64 Forest Hill Cr.</i> |
| 10 | <i>21 Beland Ct.</i> |
| 11 | 3 Cherry Rd. |
| 12 | 255 Pottruff Rd N. |
| 13 | <i>350 Pottruff Rd N.</i> |
| 14 | 21 Embury Ct. |
| 15 | <i>36 Sinclair Rd.</i> |

Notes:

- [1] *Italics* denotes noise measurement previously by Valcoustics as part of their noise impact assessment of the expressway, dated October 1980 (sites 7 to 10, 13, and 15) where long-duration measurements were not repeated by RWDI.

Table 4.1.1 Differences Between 1980 Measurement Data and 1997 Short-Duration Measurement Results

| Monitoring Location | Time of Day (EDT) | Difference (1980 Data Minus 1977 Data) | | | |
|---------------------|-------------------|--|----------|----------|----------|
| | | $L_{eq}(1)$ | L_{10} | L_{50} | L_{90} |
| Site 7 | 0900 | 3 | 0 | -2 | -5 |
| Site 8 | 1500 | 3 | 2 | 1 | 2 |
| Site 9 | 1000 | 3 | 0 | -1 | -1 |
| Site 10 | 1100 | -1 | 0 | -1 | -1 |
| Site 11 | 0900 | 8 | 2 | 2 | 4 |
| Site 12 | 1300 | -5 | -6 | -8 | -8 |
| | 1400 | 14 | -4 | -7 | -7 |
| Site 13 | 1500 | 3 | 3 | 0 | -1 |
| Site 14 | 1200 | 5 | -8 | -9 | -10 |
| Site 15 | 1000 | 8 | 5 | 2 | 2 |

Notes:

- Positive differences represent higher 1980 values.
- A *significant difference* is considered to be a difference greater than 5 dBA in two or more parameters, which accounts for instrument measurement tolerances and daily variability.
- Monitoring at Sites 11, 12 and 14 has been repeated due to significant differences from 1980 and 1997 measurements.

Table 4.2.1 Average Sound Exposures in Each Hour
Site 1 - 239 Upper Mt. Albion Road.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 53 | 55 | 52 | 51 |
| 0800 | 53 | 54 | 52 | 51 |
| 0900 | 51 | 53 | 50 | 49 |
| 1000 | 51 | 53 | 50 | 47 |
| 1100 | 50 | 52 | 49 | 47 |
| 1200 | 50 | 53 | 49 | 47 |
| 1300 | 52 | 54 | 51 | 49 |
| 1400 | 53 | 55 | 53 | 50 |
| 1500 | 54 | 56 | 54 | 51 |
| 1600 | 54 | 56 | 53 | 51 |
| 1700 | 54 | 56 | 54 | 52 |
| 1800 | 57 | 57 | 55 | 53 |
| 1900 | 54 | 56 | 53 | 51 |
| 2000 | 52 | 54 | 52 | 50 |
| 2100 | 52 | 54 | 52 | 50 |
| 2200 | 52 | 54 | 52 | 48 |
| 2300 | 52 | 54 | 50 | 46 |
| 0000 | 50 | 53 | 48 | 44 |
| 0100 | 48 | 51 | 46 | 41 |
| 0200 | 47 | 50 | 44 | 41 |
| 0300 | 44 | 47 | 42 | 40 |
| 0400 | 45 | 48 | 43 | 41 |
| 0500 | 51 | 53 | 50 | 45 |
| 0600 | 54 | 55 | 52 | 51 |

Table 4.2.2 Average Sound Exposures in Each Hour
Site 2 - 10 Tamwood Cr.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 52 | 54 | 51 | 48 |
| 0800 | 50 | 51 | 48 | 46 |
| 0900 | 50 | 51 | 49 | 46 |
| 1000 | 49 | 51 | 48 | 45 |
| 1100 | 50 | 52 | 50 | 46 |
| 1200 | 50 | 52 | 49 | 45 |
| 1300 | 67 | 70 | 50 | 46 |
| 1400 | 49 | 51 | 49 | 45 |
| 1500 | 50 | 52 | 49 | 46 |
| 1600 | 52 | 54 | 52 | 50 |
| 1700 | 53 | 54 | 53 | 51 |
| 1800 | 54 | 56 | 53 | 51 |
| 1900 | 53 | 55 | 52 | 51 |
| 2000 | 52 | 53 | 51 | 50 |
| 2100 | 52 | 53 | 51 | 49 |
| 2200 | 50 | 52 | 50 | 47 |
| 2300 | 48 | 50 | 49 | 44 |
| 0000 | 48 | 49 | 48 | 46 |
| 0100 | 47 | 49 | 46 | 43 |
| 0200 | 46 | 48 | 45 | 39 |
| 0300 | 41 | 44 | 40 | 36 |
| 0400 | 42 | 46 | 40 | 37 |
| 0500 | 45 | 48 | 45 | 41 |
| 0600 | 50 | 51 | 47 | 45 |

Table 4.2.3 Average Sound Exposures in Each Hour
Site 3 - 74 Brookstream Ct.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 43 | 44 | 42 | 41 |
| 0800 | 44 | 45 | 43 | 42 |
| 0900 | 43 | 45 | 43 | 41 |
| 1000 | 44 | 45 | 43 | 41 |
| 1100 | 43 | 45 | 42 | 40 |
| 1200 | 45 | 45 | 43 | 41 |
| 1300 | 44 | 46 | 44 | 42 |
| 1400 | 47 | 48 | 45 | 43 |
| 1500 | 44 | 47 | 43 | 40 |
| 1600 | 44 | 45 | 43 | 41 |
| 1700 | 45 | 47 | 43 | 39 |
| 1800 | 46 | 48 | 45 | 42 |
| 1900 | 45 | 47 | 43 | 41 |
| 2000 | 46 | 48 | 44 | 42 |
| 2100 | 46 | 47 | 45 | 43 |
| 2200 | 46 | 47 | 45 | 43 |
| 2300 | 48 | 48 | 45 | 43 |
| 0000 | 46 | 48 | 46 | 44 |
| 0100 | 46 | 47 | 45 | 44 |
| 0200 | 46 | 48 | 46 | 44 |
| 0300 | 46 | 48 | 45 | 43 |
| 0400 | 47 | 46 | 43 | 41 |
| 0500 | 44 | 45 | 43 | 41 |
| 0600 | 44 | 46 | 43 | 41 |

Table 4.2.4 Average Sound Exposures in Each Hour
Site 4 - 396 Queenston Blvd.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 49 | 50 | 47 | 45 |
| 0800 | 48 | 50 | 46 | 44 |
| 0900 | 48 | 50 | 47 | 44 |
| 1000 | 47 | 49 | 46 | 44 |
| 1100 | 47 | 49 | 46 | 44 |
| 1200 | 48 | 50 | 47 | 45 |
| 1300 | 51 | 53 | 50 | 47 |
| 1400 | 51 | 54 | 50 | 48 |
| 1500 | 51 | 53 | 50 | 46 |
| 1600 | 50 | 53 | 49 | 46 |
| 1700 | 50 | 53 | 49 | 46 |
| 1800 | 51 | 53 | 49 | 46 |
| 1900 | 52 | 54 | 50 | 47 |
| 2000 | 52 | 54 | 50 | 47 |
| 2100 | 53 | 55 | 51 | 48 |
| 2200 | 51 | 53 | 50 | 47 |
| 2300 | 52 | 54 | 50 | 47 |
| 0000 | 51 | 53 | 50 | 47 |
| 0100 | 51 | 54 | 50 | 46 |
| 0200 | 51 | 53 | 50 | 46 |
| 0300 | 51 | 53 | 50 | 46 |
| 0400 | 50 | 53 | 49 | 46 |
| 0500 | 49 | 52 | 48 | 46 |
| 0600 | 50 | 52 | 48 | 46 |

Table 4.2.5 Average Sound Exposures in Each Hour
Site 5 - 12 Armstrong Ave.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 51 | 51 | 49 | 47 |
| 0800 | 49 | 51 | 48 | 46 |
| 0900 | 49 | 50 | 47 | 45 |
| 1000 | 49 | 49 | 47 | 45 |
| 1100 | 47 | 48 | 46 | 44 |
| 1200 | 52 | 51 | 47 | 45 |
| 1300 | 51 | 53 | 50 | 48 |
| 1400 | 52 | 53 | 51 | 49 |
| 1500 | 49 | 51 | 49 | 47 |
| 1600 | 51 | 52 | 50 | 48 |
| 1700 | 54 | 52 | 49 | 48 |
| 1800 | 51 | 52 | 50 | 48 |
| 1900 | 53 | 52 | 50 | 48 |
| 2000 | 53 | 52 | 50 | 48 |
| 2100 | 56 | 54 | 50 | 49 |
| 2200 | 61 | 54 | 51 | 50 |
| 2300 | 54 | 54 | 49 | 47 |
| 0000 | 56 | 52 | 49 | 48 |
| 0100 | 55 | 51 | 49 | 48 |
| 0200 | 62 | 54 | 51 | 49 |
| 0300 | 59 | 56 | 52 | 50 |
| 0400 | 60 | 54 | 52 | 50 |
| 0500 | 56 | 54 | 52 | 50 |
| 0600 | 51 | 53 | 50 | 49 |

Table 4.2.6 Average Sound Exposures in Each Hour
Site 6 - 20 Parklands Dr.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 48 | 45 | 40 | 38 |
| 0800 | 49 | 47 | 41 | 39 |
| 0900 | 43 | 42 | 40 | 38 |
| 1000 | 42 | 43 | 41 | 40 |
| 1100 | 49 | 44 | 41 | 39 |
| 1200 | 45 | 45 | 43 | 42 |
| 1300 | 48 | 48 | 46 | 44 |
| 1400 | 48 | 49 | 46 | 45 |
| 1500 | 47 | 49 | 46 | 43 |
| 1600 | 47 | 49 | 44 | 41 |
| 1700 | 45 | 48 | 43 | 39 |
| 1800 | 45 | 48 | 43 | 39 |
| 1900 | 47 | 50 | 45 | 40 |
| 2000 | 50 | 53 | 47 | 42 |
| 2100 | 50 | 53 | 47 | 42 |
| 2200 | 50 | 54 | 48 | 42 |
| 2300 | 50 | 52 | 46 | 41 |
| 0000 | 49 | 51 | 45 | 40 |
| 0100 | 50 | 54 | 44 | 39 |
| 0200 | 44 | 45 | 40 | 38 |
| 0300 | 47 | 47 | 41 | 38 |
| 0400 | 45 | 44 | 42 | 40 |
| 0500 | 45 | 44 | 41 | 39 |
| 0600 | 46 | 48 | 41 | 39 |

Table 4.2.7 Average Sound Exposures in Each Hour
Site 7 - 32 Jamie Anne Cr.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 44 | 43 | 42 | 40 |
| 0800 | 50 | 46 | 43 | 41 |
| 0900 | 48 | 46 | 42 | 38 |
| 1000 | 48 | 50 | 41 | 37 |
| 1100 | 43 | 44 | 39 | 36 |
| 1200 | 50 | 45 | 40 | 36 |
| 1300 | 45 | 44 | 39 | 35 |
| 1400 | 45 | 46 | 41 | 36 |
| 1500 | 49 | 50 | 43 | 39 |
| 1600 | 51 | 49 | 42 | 36 |
| 1700 | 44 | 43 | 39 | 34 |
| 1800 | 53 | 52 | 47 | 43 |
| 1900 | 49 | 51 | 46 | 42 |
| 2000 | 49 | 52 | 45 | 41 |
| 2100 | 50 | 47 | 41 | 39 |
| 2200 | 44 | 45 | 42 | 40 |
| 2300 | 44 | 43 | 42 | 40 |
| 0000 | 43 | 44 | 41 | 39 |
| 0100 | 45 | 46 | 42 | 39 |
| 0200 | 44 | 47 | 42 | 38 |
| 0300 | 40 | 41 | 38 | 36 |
| 0400 | 39 | 38 | 37 | 36 |
| 0500 | 40 | 39 | 38 | 36 |
| 0600 | 42 | 41 | 40 | 37 |

Table 4.2.8 Average Sound Exposures in Each Hour
Site 8 - 108 Albion Falls Blvd.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 60 | 58 | 50 | 46 |
| 0800 | 53 | 54 | 51 | 49 |
| 0900 | 50 | 52 | 48 | 45 |
| 1000 | 52 | 53 | 48 | 44 |
| 1100 | 49 | 50 | 46 | 43 |
| 1200 | 50 | 51 | 47 | 43 |
| 1300 | 49 | 50 | 46 | 43 |
| 1400 | 49 | 51 | 47 | 44 |
| 1500 | 52 | 53 | 49 | 47 |
| 1600 | 52 | 52 | 50 | 47 |
| 1700 | 52 | 52 | 49 | 46 |
| 1800 | 54 | 55 | 48 | 45 |
| 1900 | 52 | 53 | 48 | 45 |
| 2000 | 58 | 53 | 48 | 45 |
| 2100 | 49 | 49 | 46 | 43 |
| 2200 | 47 | 47 | 45 | 42 |
| 2300 | 46 | 47 | 44 | 41 |
| 0000 | 44 | 46 | 42 | 39 |
| 0100 | 42 | 43 | 40 | 38 |
| 0200 | 40 | 41 | 38 | 37 |
| 0300 | 40 | 40 | 38 | 36 |
| 0400 | 41 | 41 | 39 | 37 |
| 0500 | 47 | 47 | 42 | 40 |
| 0600 | 48 | 49 | 46 | 42 |

Table 4.2.9 Average Sound Exposures in Each Hour
Site 9 - 64 Forest Hill Cr.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 44 | 45 | 43 | 41 |
| 0800 | 48 | 47 | 44 | 42 |
| 0900 | 43 | 44 | 41 | 40 |
| 1000 | 42 | 41 | 37 | 35 |
| 1100 | 45 | 45 | 39 | 36 |
| 1200 | 48 | 44 | 38 | 35 |
| 1300 | 65 | 70 | 44 | 39 |
| 1400 | 58 | 46 | 40 | 38 |
| 1500 | 46 | 47 | 42 | 39 |
| 1600 | 46 | 47 | 43 | 39 |
| 1700 | 49 | 48 | 44 | 40 |
| 1800 | 49 | 46 | 41 | 38 |
| 1900 | 44 | 46 | 40 | 37 |
| 2000 | 51 | 55 | 41 | 38 |
| 2100 | 44 | 45 | 39 | 36 |
| 2200 | 45 | 45 | 41 | 38 |
| 2300 | 43 | 44 | 41 | 39 |
| 0000 | 46 | 43 | 40 | 38 |
| 0100 | 40 | 40 | 38 | 36 |
| 0200 | 39 | 40 | 38 | 36 |
| 0300 | 41 | 42 | 40 | 38 |
| 0400 | 41 | 42 | 40 | 37 |
| 0500 | 50 | 48 | 40 | 36 |
| 0600 | 48 | 48 | 40 | 36 |

Table 4.2.10 Average Sound Exposures in Each Hour
Site 10 - 21 Beland Ct.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 55 | 56 | 49 | 47 |
| 0800 | 51 | 51 | 48 | 46 |
| 0900 | 50 | 51 | 48 | 45 |
| 1000 | 50 | 50 | 47 | 45 |
| 1100 | 83 | 53 | 49 | 46 |
| 1200 | 50 | 50 | 47 | 45 |
| 1300 | 52 | 53 | 51 | 45 |
| 1400 | 53 | 54 | 52 | 51 |
| 1500 | 54 | 54 | 52 | 51 |
| 1600 | 54 | 54 | 53 | 51 |
| 1700 | 50 | 50 | 47 | 45 |
| 1800 | 52 | 50 | 47 | 44 |
| 1900 | 51 | 48 | 45 | 43 |
| 2000 | 80 | 52 | 46 | 44 |
| 2100 | 50 | 49 | 46 | 44 |
| 2200 | 48 | 49 | 46 | 44 |
| 2300 | 49 | 49 | 46 | 44 |
| 0000 | 49 | 49 | 46 | 43 |
| 0100 | 46 | 57 | 43 | 41 |
| 0200 | 43 | 45 | 40 | 37 |
| 0300 | 59 | 54 | 39 | 37 |
| 0400 | 39 | 40 | 37 | 36 |
| 0500 | 43 | 44 | 40 | 37 |
| 0600 | 51 | 51 | 47 | 43 |

Table 4.2.11 Average Sound Exposures in Each Hour
Site 11 - 3 Cherry Road

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 55 | 58 | 53 | 47 |
| 0800 | 57 | 59 | 55 | 50 |
| 0900 | 58 | 60 | 58 | 53 |
| 1000 | 58 | 61 | 58 | 54 |
| 1100 | 60 | 62 | 59 | 56 |
| 1200 | 60 | 62 | 59 | 56 |
| 1300 | 59 | 61 | 59 | 56 |
| 1400 | 57 | 59 | 55 | 52 |
| 1500 | 61 | 63 | 60 | 55 |
| 1600 | 60 | 62 | 59 | 56 |
| 1700 | 61 | 62 | 60 | 56 |
| 1800 | 59 | 62 | 59 | 53 |
| 1900 | 59 | 61 | 58 | 54 |
| 2000 | 59 | 61 | 58 | 53 |
| 2100 | 58 | 61 | 57 | 52 |
| 2200 | 60 | 61 | 58 | 52 |
| 2300 | 58 | 60 | 57 | 53 |
| 0000 | 58 | 60 | 56 | 51 |
| 0100 | 56 | 59 | 54 | 49 |
| 0200 | 55 | 58 | 53 | 47 |
| 0300 | 51 | 55 | 49 | 41 |
| 0400 | 48 | 52 | 44 | 38 |
| 0500 | 51 | 55 | 48 | 39 |
| 0600 | 53 | 56 | 52 | 45 |

Table 4.2.12 Average Sound Exposures in Each Hour
Site 12 - 255 Pottruff Rd. N.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 50 | 51 | 49 | 48 |
| 0800 | 52 | 54 | 50 | 49 |
| 0900 | 53 | 57 | 50 | 49 |
| 1000 | 51 | 52 | 49 | 47 |
| 1100 | 50 | 51 | 47 | 45 |
| 1200 | 46 | 48 | 44 | 43 |
| 1300 | 55 | 56 | 49 | 45 |
| 1400 | 53 | 56 | 51 | 45 |
| 1500 | 49 | 50 | 46 | 45 |
| 1600 | 49 | 50 | 48 | 46 |
| 1700 | 51 | 52 | 49 | 47 |
| 1800 | 49 | 51 | 48 | 47 |
| 1900 | 46 | 48 | 46 | 44 |
| 2000 | 45 | 47 | 45 | 43 |
| 2100 | 48 | 50 | 46 | 45 |
| 2200 | 47 | 49 | 46 | 45 |
| 2300 | 46 | 48 | 46 | 45 |
| 0000 | 46 | 47 | 45 | 44 |
| 0100 | 47 | 49 | 46 | 45 |
| 0200 | 48 | 50 | 48 | 47 |
| 0300 | 47 | 49 | 46 | 45 |
| 0400 | 48 | 50 | 47 | 46 |
| 0500 | 50 | 52 | 50 | 49 |
| 0600 | 51 | 52 | 51 | 49 |

Table 4.2.13 Average Sound Exposures in Each Hour
Site 13 - 350 Pottruff Road N.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 55 | 55 | 51 | 48 |
| 0800 | 54 | 55 | 50 | 47 |
| 0900 | 54 | 55 | 50 | 47 |
| 1000 | 58 | 59 | 51 | 47 |
| 1100 | 65 | 69 | 54 | 47 |
| 1200 | 53 | 54 | 50 | 47 |
| 1300 | 53 | 54 | 50 | 47 |
| 1400 | 53 | 54 | 50 | 46 |
| 1500 | 58 | 60 | 53 | 49 |
| 1600 | 57 | 57 | 52 | 48 |
| 1700 | 61 | 65 | 52 | 47 |
| 1800 | 53 | 54 | 50 | 47 |
| 1900 | 56 | 58 | 51 | 48 |
| 2000 | 56 | 56 | 50 | 46 |
| 2100 | 54 | 52 | 47 | 44 |
| 2200 | 51 | 52 | 48 | 46 |
| 2300 | 52 | 52 | 49 | 45 |
| 0000 | 49 | 51 | 46 | 43 |
| 0100 | 48 | 49 | 45 | 42 |
| 0200 | 49 | 50 | 47 | 45 |
| 0300 | 48 | 50 | 46 | 44 |
| 0400 | 50 | 51 | 48 | 45 |
| 0500 | 50 | 52 | 48 | 45 |
| 0600 | 53 | 54 | 51 | 48 |

Table 4.2.14 Average Sound Exposures in Each Hour
Site 14 - 21 Embury Ct.

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 55 | 56 | 55 | 53 |
| 0800 | 54 | 55 | 53 | 52 |
| 0900 | 54 | 56 | 53 | 51 |
| 1000 | 54 | 55 | 53 | 52 |
| 1100 | 58 | 58 | 56 | 54 |
| 1200 | 64 | 58 | 55 | 53 |
| 1300 | 63 | 59 | 55 | 54 |
| 1400 | 67 | 59 | 56 | 54 |
| 1500 | 63 | 57 | 55 | 54 |
| 1600 | 55 | 56 | 54 | 52 |
| 1700 | 54 | 56 | 54 | 52 |
| 1800 | 54 | 54 | 52 | 50 |
| 1900 | 55 | 55 | 52 | 51 |
| 2000 | 56 | 57 | 55 | 53 |
| 2100 | 55 | 57 | 55 | 53 |
| 2200 | 54 | 56 | 54 | 52 |
| 2300 | 65 | 56 | 53 | 52 |
| 0000 | 57 | 55 | 52 | 50 |
| 0100 | 56 | 52 | 50 | 49 |
| 0200 | 52 | 54 | 52 | 51 |
| 0300 | 52 | 54 | 52 | 51 |
| 0400 | 66 | 53 | 51 | 50 |
| 0500 | 73 | 54 | 52 | 50 |
| 0600 | 60 | 55 | 53 | 52 |

Table 4.2.15 Average Sound Exposures in Each Hour
Site 15 - 36 Sinclair Road

| Hour Beginning (EDT) | Leq (1) (dBA) | L10 (dBA) | L50 (dBA) | L90 (dBA) |
|-------------------------|------------------|--------------|--------------|--------------|
| 0700 | 54 | 54 | 52 | 50 |
| 0800 | 52 | 53 | 49 | 46 |
| 0900 | 50 | 51 | 47 | 44 |
| 1000 | 54 | 53 | 47 | 44 |
| 1100 | 51 | 52 | 48 | 46 |
| 1200 | 54 | 55 | 50 | 47 |
| 1300 | 52 | 53 | 49 | 47 |
| 1400 | 51 | 53 | 49 | 46 |
| 1500 | 52 | 53 | 50 | 46 |
| 1600 | 53 | 53 | 50 | 49 |
| 1700 | 51 | 52 | 50 | 48 |
| 1800 | 51 | 52 | 49 | 47 |
| 1900 | 51 | 51 | 48 | 46 |
| 2000 | 51 | 51 | 48 | 46 |
| 2100 | 49 | 50 | 47 | 45 |
| 2200 | 47 | 49 | 45 | 43 |
| 2300 | 50 | 47 | 44 | 41 |
| 0000 | 52 | 47 | 43 | 40 |
| 0100 | 48 | 48 | 47 | 45 |
| 0200 | 49 | 50 | 48 | 46 |
| 0300 | 49 | 59 | 48 | 46 |
| 0400 | 49 | 50 | 48 | 47 |
| 0500 | 51 | 51 | 49 | 47 |
| 0600 | 60 | 54 | 52 | 50 |

Table 4.2.16 Ambient 24-Hour Equivalent Sound Exposures [1]

| Site No. | Site Location | Ambient L _{eq} (24) (dBA) |
|----------|-------------------------------|---------------------------------------|
| 1 | 239 Upper Mt. Albion Rd. | 52 |
| 2 | 10 Tamwood Cr. | 50 |
| 3 | 74 Brookstream Ct. | 45 |
| 4 | 396 Queenston Blvd | 50 |
| 5 | 12 Armstrong Ave. | 48 |
| 6 | 20 Parklands Drive. | 48 |
| 7 | <i>32 Jamie Anne Cr.</i> | <i>47</i> |
| 8 | <i>108 Albion Falls Blvd.</i> | <i>52</i> |
| 9 | <i>64 Forest Hill Cr.</i> | <i>53</i> |
| 10 | <i>21 Beland Ct.</i> | <i>52</i> |
| 11 | 3 Cherry Rd. | 58 |
| 12 | 255 Pottruff Rd N. | 50 |
| 13 | <i>350 Pottruff Rd N.</i> | <i>56</i> |
| 14 | 21 Embury Ct. | 62 |
| 15 | <i>36 Sinclair Rd.</i> | <i>52</i> |

Notes:

- [1] *Italics* denotes noise measurement previously by Valcoustics as part of their noise impact assessment of the expressway, dated October 1980 (sites 7 to 10, 13, and 15) where long-duration measurements were not repeated by RWDI.

Table 4.2.17 Short-Duration Ambient Noise Measurements - Green Spaces

| Site No. | Site Location | Date | Time of Measurement (EDT) | L _{eq} (1) (dBA) | L _{min} (dBA) | L _{max} (dBA) |
|----------|---|------------------------|---------------------------|---------------------------|------------------------|------------------------|
| A | Lakeland Community Centre | Fri. Oct. 10, 1997 | 0905 | 70 | 66 | 74 |
| | | Tues. Oct. 14, 1997 | 1540 | 69 | 65 | 74 |
| B | Confederation Park | Fri. Oct. 10, 1997 | 0945 | 66 | 60 | 82 |
| | | Tues. Oct. 14, 1997 | 1640 | 66 | 61 | 74 |
| C | Globe Park | Fri. Oct. 10, 1997 | 1020 | 55 | 51 | 64 |
| D | Hillcrest Park | Fri. Oct. 10, 1997 | 1110 | 52 | 48 | 62 |
| | | Sun. Oct. 12, 1997 | 1350 | 51 | 47 | 59 |
| E | Red Hill Bowl Park | Fri. Oct. 10, 1997 | 1150 | 46 | 42 | 59 |
| | | Sun. Oct. 12, 1997 | 1500 | 45 | 40 | 55 |
| F | Hixon Bowl Park | Fri. Oct. 10, 1997 | 1255 | 49 | 47 | 53 |
| | | Sun. Oct. 12, 1997 | 1540 | 50 | 46 | 58 |
| G | Red Hill Valley Recreational Trail, Mt. Albion Entrance | Fri. Oct. 10, 1997 | 1400 | 51 | 49 | 56 |
| | | Sun. Oct. 12, 1997 | 1225 | 51 | 49 | 56 |
| H | Red Hill Valley Recreational Trail, Mud St. Entrance | Fri. Oct. 10, 1997 | 1440 | 53 | 50 | 57 |
| | | Sun. Oct. 12, 1997 [1] | 1140 | 53 | 50 | 58 |
| I | Kings Forest Park | Fri. Oct. 10, 1997 | 1515 | 52 | 45 | 60 |
| | | Sun. Oct. 12, 1997 | 1100 | 48 | 42 | 59 |
| J | Kings Forest Golf Course | Fri. Oct. 10, 1997 | 1610 | 43 | 40 | 54 |
| | | Sun. Oct. 12, 1997 | 1615 | 44 | 40 | 58 |
| K | Glencastle Park | Sun. Oct. 12, 1997 | 1300 | 42 | 38 | 59 |
| L | Hutchs Restaurant | Tues. Oct. 14, 1997 | 1610 | 66 | 59 | 72 |
| M | Greenhill Bowl Park | Wed. Aug. 6, 1997 [2] | 1110 | 39 | 35 | 50 |
| | | Sun. Oct. 12, 1997 | 1645 | 41 | 39 | 55 |

Notes:

- All measurements are of 20 minutes duration unless otherwise noted.
- [1] measurement duration of 15 minutes only, due to increased pedestrian traffic in the area of the measurement site.
- [2] measurement duration of 27.6 minutes.

Table 5.1.1: Traffic Data

| Roadway | Roadway Link | PM Peak Traffic | AADT | Truck Traffic | | Posted Speed Limit (km/h) |
|---------------------|---|-----------------|-------|---------------|-----------|---------------------------|
| | | | | Medium (%) | Heavy (%) | |
| Albright Rd. | West of Mt. Albion Rd. | 200 | 2000 | 1 | 0 | 50 |
| | bt. Mt. Albion Rd. and Quigley Rd. | 300 | 3000 | 1 | 0 | 50 |
| Armstrong Ave. | all | 50 | 500 | 1 | 0 | 50 |
| Barton St. | bt. Centennial Parkway and Nash Rd. | 2400 | 24000 | 3 | 1 | 50 |
| | bt. Nash Rd. and Woodward Ave. | 2800 | 28000 | 3 | 1 | 50 |
| | bt. Woodward Ave. and Parkdale Ave. | 1900 | 19000 | 3 | 2 | 50 |
| Cochrane Rd. | bt Greenhill Ave. (west segment) and Lawrence Rd. | 500 | 5000 | 0 | 0 | 50 |
| Glen Castle Dr. | bt. Mt. Albion and Glen Vista Dr. | 200 | 2000 | 0 | 0 | 50 |
| Glen Vista Dr. | bt. Glen Castle and Greenhill Ave. | 200 | 2000 | 0 | 0 | 50 |
| Greenhill Ave. | bt. Kimberly Drive to Cochrane Road | 150 | 1500 | 0 | 0 | 50 |
| | bt Mt. Albion and existing termination (west section) | 1200 | 12000 | 1 | 0 | 50 |
| | bt. Mt. Albion and Quigley Rd. (east section) | 1200 | 12000 | 1 | 0 | 50 |
| | extension to new RHCE ramping. | 1000 | 10000 | 1 | 0 | 50 |
| Harrisford St. | all | 50 | 500 | 0 | 0 | 50 |
| Hixon Road | bt. Cochrane Rd. and Parkdale Ave. | 100 | 1000 | 0 | 0 | 50 |
| | bt. Mt. Albion Rd. and Fairridge Rd. | 50 | 500 | 0 | 0 | 50 |
| King St. East | bt. Quigley Rd. and Mt. Albion Rd. | 2400 | 24000 | 2 | 0 | 50 |
| | bt. Mt. Albion Rd. and Parkdale Ave. | 2900 | 29000 | 2 | 0 | 50 |
| | bt. Parkdale Ave. and Kennilworth Ave. S. | 2700 | 27000 | 2 | 0 | 50 |
| Lawrence Rd. | bt. King St. and Parkdale Ave. | 1000 | 10000 | 1 | 0 | 50 |
| | bt. Parkdale and Kennilworth Ave. | 1000 | 10000 | 1 | 0 | 50 |
| Mnt. Albion Rd. | bt. Glen Castle Dr. and Greenhill Ave. | 300 | 3000 | 0 | 0 | 50 |
| | bt. Greenhill Ave. and King St. | 600 | 6000 | 0 | 0 | 50 |
| Mountain Brow Blvd. | bt. Mohawk Rd. E and Limeridge Rd E | 1000 | 10000 | 0 | 0 | 50 |
| | bt. Limeridge Rd. E and Fennell Ave. E | 700 | 7000 | 0 | 0 | 50 |
| Melvin Ave. | bt. Woodward Ave. and Barton St. | 0 | 0 | 0 | 0 | 50 |
| | bt. Parkdale Ave. and Woodward Ave. | 700 | 7000 | 0 | 0 | 50 |
| Nash Rd. | bt. King St. and Queenston Rd. | 1000 | 10000 | 1 | 1 | 50 |
| | bt. Queenston Rd. and Barton St. | 1000 | 10000 | 2 | 1 | 50 |
| | bt. Barton St. and Brampton St. | 1100 | 11000 | 3 | 1 | 50 |
| Paramount Dr. | bt. Mud St. and Mud. St. | 150 | 1500 | 0 | 0 | 50 |
| Parkdale Ave. | bt. Hixon Rd. and Lawrence Rd. | 100 | 1000 | 0 | 0 | 50 |

Table 5.1.1 cont'd: Traffic Data

| Roadway | Roadway Link | PM Peak Traffic | AADT | Truck Traffic | | Posted Speed Limit (km/h) |
|---------------------------|---|-----------------|-------|---------------|-----------|---------------------------|
| | | | | Medium (%) | Heavy (%) | |
| | bt. Lawrence Rd. and King St. | 300 | 3000 | 0 | 0 | 50 |
| | bt. King St. and Queenston Rd. | 1400 | 14000 | 1 | 1 | 50 |
| | bt. Queenston Rd. and Melvin Ave. | 1500 | 15000 | 1 | 1 | 50 |
| Potruff Rd. | bt. King St. and Queenston Rd. | 150 | 1500 | 1 | 0 | 50 |
| | bt. Queenston Rd. and Barton St. | 150 | 1500 | 1 | 0 | 50 |
| Red Hill Creek Expressway | bt. Mud St. and Greenhill Ave. intersection Northbound | 2100 | 21000 | 7.5 | 7.5 | 90 |
| | bt. Mud St. and Greenhill Ave. intersection Southbound | 3100 | 31000 | 7.5 | 7.5 | 90 |
| | Northbound ramp from RHCE to Greenhill Ave. | 300 | 3000 | 7.5 | 7.5 | 50 |
| | Northbound ramp from Greenhill Ave. to RHCE | 200 | 2000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from RHCE to Greenhill Ave. | 200 | 2000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from Greenhill Ave. to RHCE | 300 | 3000 | 7.5 | 7.5 | 50 |
| | bt. Greenhill Ave. intersection and King St. intersection Northbound | 1800 | 18000 | 7.5 | 7.5 | 90 |
| | bt. Greenhill Ave. intersection and King St. intersection Southbound | 3200 | 32000 | 7.5 | 7.5 | 90 |
| | Northbound ramp from RHCE to King St. | 500 | 5000 | 7.5 | 7.5 | 50 |
| | Northbound ramp from King St. to RHCE | 300 | 3000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from RHCE to King St. | 600 | 6000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from King St. to RHCE | 800 | 8000 | 7.5 | 7.5 | 50 |
| | bt. King St. intersection and Queenston Rd. intersection Northbound | 1600 | 16000 | 7.5 | 7.5 | 90 |
| | bt. King St. intersection and Queenston Rd. intersection Southbound | 3000 | 30000 | 7.5 | 7.5 | 90 |
| | Northbound ramp from RHCE to Queenston Rd. | 300 | 3000 | 7.5 | 7.5 | 50 |
| | Northbound ramp from Queenston Rd. to RHCE | 400 | 4000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from RHCE to Queenston Rd. | 300 | 3000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from Queenston Rd. to RHCE | 800 | 8000 | 7.5 | 7.5 | 50 |
| | bt. Queenston Rd. intersection and Barton St. intersection Northbound | 1700 | 17000 | 7.5 | 7.5 | 90 |

Table 5.1.1 cont'd: Traffic Data

| Roadway | Roadway Link | PM Peak Traffic | AADT | Truck Traffic | | Posted Speed Limit (km/h) |
|------------------------|---|-----------------|-------|---------------|-----------|---------------------------|
| | | | | Medium (%) | Heavy (%) | |
| | bt. Queenston Rd. intersection and Barton St. intersection Southbound | 2500 | 25000 | 7.5 | 7.5 | 90 |
| | Northbound ramp from RHCE to Barton St. | 400 | 4000 | 7.5 | 7.5 | 50 |
| | Northbound ramp from Barton St. to RHCE | 700 | 7000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from RHCE to Barton St. | 900 | 9000 | 7.5 | 7.5 | 50 |
| | Southbound ramp from Barton St. to RHCE | 700 | 7000 | 7.5 | 7.5 | 50 |
| | bt. Barton St. intersection and Q.E.W. Northbound | 2100 | 21000 | 7.5 | 7.5 | 90 |
| | bt. Barton St. intersection and Q.E.W. Southbound | 2500 | 25000 | 7.5 | 7.5 | 90 |
| Queenston Rd. | bt. Parkdale Ave. and Nash Road | 2100 | 21000 | 5 | 5 | 50 |
| Reid Ave. | bt. Lucerne Ave. and Central Ave. | 20 | 200 | 0 | 0 | 50 |
| | bt. Central Ave. and Main St. | 150 | 1500 | 0 | 0 | 50 |
| | bt. Main St. and Roxborough Ave. | 250 | 2500 | 0 | 0 | 50 |
| Upper Kennilworth Ave. | bt. Mohawk Rd. E and Limeridge Rd E | 300 | 3000 | 0 | 0 | 50 |
| | bt. Mohawk Rd. E and Fennell Ave. E | 250 | 2500 | 0 | 0 | 50 |
| Woodward Ave. | bt. Melvin Ave. and Barton St. | 500 | 5000 | 0 | 0 | 50 |
| | bt. Barton St. and Brampton St. | 1000 | 10000 | 3 | 2 | 50 |
| Small Side Streets | — | 50 | 500 | 0 | 0 | 50 |

Table 5.2.1: Projected Sound Levels, SL, for Future Build Scenarios (Unmitigated and Mitigated)

| Segment Name | Start / End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | | Future Build SL Excess Over 55 dBA (dB) | | Future Build SL Excess Over Future No-Build SL (dB) | | Mitigation Recommended | Comments |
|--------------|-------------|--------------------------|---------------------------------|-----------|---|-----------|---|-----------|--|---|
| | | | Unmitigated | Mitigated | Unmitigated | Mitigated | Unmitigated | Mitigated | | |
| S1-L1 | S | 52 | 58 | 53 | 3 | - | 6 | 1 | 2m NE-EW-WE ramp | Alternatively, 2.5m PLB [1] (mitigates to 55 dBA) |
| S1-L1 | E | 52 | 51 | 51 | - | - | - | - | No Mitigation | Mitigation Not Recommended |
| S1-L2 | S | 52 | 52 | 52 | - | - | - | - | No Mitigation | Mitigation Not Recommended |
| S1-L2 | E | 52 | 63 | 56 | 8 | 1 | 11 | 4 | 3m NE-EW-WE ramp | |
| S1-L4 | S | 52 | 64 | 57 | 9 | 2 | 12 | 5 | Mainline: 5m @ Pritchard to 3m @ NE-EW ramp | Alternatively, 3m PLB and 3m Mainline Pritchard to NE-EW ramp (mitigates to 59 dBA) |
| S1-L4 | E | 52 | 57 | 57 | 2 | 2 | 5 | 5 | No Mitigation | Mitigation Not Recommended |
| S1-L5 | S | 52 | 60 | 56 | 5 | 1 | 8 | 4 | 3m Mainline, 2m NE-EW ramp | |
| S1-L6 | S | 50 | 50 | 50 | - | - | - | - | No Mitigation | Mitigation Not Recommended |
| S4-L1 | S | 45 | 61 | 52 | 6 | - | 16 | 7 | 4 m Highway Barrier | Alternatively, 3 m PLB |
| | E | 45 | 62 | 53 | 7 | - | 17 | 8 | 4 m Highway Barrier | Alternatively, 3 m PLB |
| S4-L2 | S/E | 45 | 70 | 58 | 15 | 3 | 25 | 13 | 4 m Highway Barrier | Playground |
| S4-L3 | S | 45 | 62 | 53 | 7 | - | 17 | 8 | 4 m Highway Barrier | Alternatively, 3 m PLB |
| S5-L1/R1 | S | 45 | 63 | 53 | 8 | - | 18 | 8 | 4 m Highway Barrier | Alternatively, 3 m PLB |
| | E | 45 | 64 | 56 | 9 | 1 | 19 | 11 | 4 m Highway Barrier plus 3 m PLB parallel to Greenhill | Alternatively, 3 m PLB parallel to RHCE |

Table 5.2.1 cont'd: Projected Sound Levels, SL, for Future Build Scenarios (Unmitigated and Mitigated)

| Segment Name | Start / End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | | Future Build SL Excess Over 55 dBA (dB) | | Future Build SL Excess Over Future No-Build SL (dB) | | Mitigation Recommended | Comments |
|--------------|-------------|--------------------------|---------------------------------|-----------|---|-----------|---|-----------|---|---|
| | | | Unmitigated | Mitigated | Unmitigated | Mitigated | Unmitigated | Mitigated | | |
| S5-L2/R2 | S | 45 | 64 | 56 | 9 | 1 | 19 | 11 | 4 m Highway Barrier plus 3 m PLB parallel to Greenhill | Alternatively, 3 m PLB parallel to RHCE |
| S5-L2/R2 | E | 45 | 57 | 52 | 2 | - | 12 | 7 | 2.4 m PLB parallel to Greenhill | Minimal RHCE contribution |
| S5-L3/R3 | E | 45 | 57 | 52 | 2 | - | 12 | 7 | 2.4 m PLB parallel to Greenhill | Minimal RHCE contribution |
| S5-L4/R4 | S | 45 | 64 | 55 | 9 | - | 19 | 10 | 3 m PLB parallel to RHCE plus 3 m PLB parallel to Greenhill | |
| S5-L4/R4 | E | 45 | 64 | 54 | 9 | - | 19 | 9 | 3 m PLB adjacent to RHCE | |
| S5-L5/R5 | S | 45 | 52 | 47 | - | - | 7 | 2 | 2.4 m PLB adjacent to RHCE | |
| S5-L6 | E | 45 | 62 | 58 | 7 | 3 | 17 | 13 | 3 m PLB adjacent to RHCE | Playground |
| S5-L7 | S | 48 | 52 | 48 | - | - | 4 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| S5-L8 | E | 48 | 59 | 48 | 4 | - | 11 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| S5-L8 | S | 48 | 62 | 57 | 7 | 2 | 14 | 9 | 3 m PLB adjacent to RHCE | |
| S5-L9 | S | 48 | 55 | 48 | - | - | 7 | - | 2.4 m PLB adjacent to RHCE | Achieves ambient |
| S5-L9 | E | 48 | 60 | 51 | 5 | - | 12 | 3 | 3 m PLB adjacent to RHCE | |
| S5-L10 | S | 48 | 58 | 51 | 3 | - | 10 | 3 | 3 m PLB adjacent to RHCE | |
| S6-L1/R6 | S | 52 | 61 | 56 | 6 | 1 | 9 | 4 | 3 m PLB adjacent to RHCE | |

Table 5.2.1 cont'd: Projected Sound Levels, SL, for Future Build Scenarios (Unmitigated and Mitigated)

| Segment Name | Start / End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | | Future Build SL Excess Over 55 dBA (dB) | | Future Build SL Excess Over Future No-Build SL (dB) | | Mitigation Recommended | Comments |
|--------------|-------------|--------------------------|---------------------------------|-----------|---|-----------|---|-----------|-----------------------------|-----------------------------------|
| | | | Unmitigated | Mitigated | Unmitigated | Mitigated | Unmitigated | Mitigated | | |
| S6-L1/R6 | E | 52 | 66 | 59 | 11 | 4 | 14 | 9 | 3 m PLB adjacent to RHCE | |
| S6-L3/R8 | S | 52 | 59 | 52 | 4 | - | 7 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| S6-L5 | S | 52 | 62 | 53 | 7 | - | 10 | 1 | 3 m PLB adjacent to RHCE | Achieves ambient |
| R12 | S | 52 | 59 | 54 | 4 | - | 7 | 2 | 3 m PLB adjacent to RHCE | |
| | E | 52 | 65 | 55 | 10 | - | 13 | 3 | 3 m PLB adjacent to RHCE | |
| R14 | S | 52 | 60 | 55 | 5 | - | 8 | 3 | 2 m PLB adjacent to King St | |
| | E | 52 | 57 | 53 | 2 | - | 5 | 1 | 2 m PLB adjacent to King St | Achieves ambient |
| R15 | E | 52 | 55 | 55 | - | - | 3 | 3 | No Mitigation | Mitigation Not Recommended |
| S6-L6/R16 | S | 52 | 63 | 53 | 8 | - | 11 | 1 | 3 m PLB adjacent to RHCE | Achieves ambient |
| | E | 52 | 63 | 53 | 8 | - | 11 | 1 | 3 m PLB adjacent to RHCE | Achieves ambient |
| S6-L7 | S | 52 | 64 | 59 | 9 | 4 | 12 | 7 | 3 m PLB adjacent to RHCE | |
| | E | 52 | 63 | 57 | 8 | 2 | 11 | 5 | 3 m PLB adjacent to RHCE | |
| S6-L8 | S | 52 | 63 | 53 | 8 | - | 11 | 1 | 3 m PLB adjacent to RHCE | Achieves ambient |
| S7-L1 | S | 52 | 63 | 57 | 8 | 2 | 11 | 5 | 3 m PLB adjacent to RHCE | |
| S7-L2/R20 | S | 52 | 57 | 48 | 2 | - | 5 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| | E | 58 [2] | 63 | 53 | 8 | - | 5 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| S7-L3/R21 | S | 58 [2] | 59 | 51 | 4 | - | 1 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| S7-L4/R22 | S | 64 | 65 | 64 | 10 | 9 | 1 | - | 3 m PLB adjacent to RHCE | Current Ambient due to Potruff Rd |
| | E | 63 | 64 | 63 | 9 | 8 | 1 | - | 3 m PLB adjacent to RHCE | Current Ambient due to Potruff Rd |

Table 5.2.1 cont'd: Projected Sound Levels, SL, for Future Build Scenarios (Unmitigated and Mitigated)

| Segment Name | Start / End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | | Future Build SL Excess Over 55 dBA (dB) | | Future Build SL Excess Over Future No-Build SL (dB) | | Mitigation Recommended | Comments |
|--------------|-------------|--------------------------|---------------------------------|-----------|---|-----------|---|-----------|----------------------------|-------------------------|
| | | | Unmitigated | Mitigated | Unmitigated | Mitigated | Unmitigated | Mitigated | | |
| S7-L5 | S | 50 | 59 | 55 | 4 | - | 9 | 5 | 3 m PLB adjacent to RHCE | |
| S7-L6/R31 | S | 48 | 68 | 57 | 13 | 2 | 20 | 9 | 3 m PLB adjacent to RHCE | |
| | E | 48 | 67 | 58 | 12 | 3 | 19 | 10 | 3 m PLB adjacent to RHCE | |
| S7-L7 | S | 48 | 57 | 53 | 2 | - | 9 | 5 | 3 m PLB adjacent to RHCE | |
| S8-L1/R40 | S | 50 | 65 | 56 | 10 | 1 | 15 | 6 | 3 m PLB adjacent to RHCE | |
| | E | 56 [2] | 61 | 57 | 6 | 2 | 5 | 1 | 3 m PLB adjacent to RHCE | Achieves ambient |
| S8-L2/R41 | S | 56 [2] | 64 | 57 | 9 | 2 | 8 | 1 | 3 m PLB adjacent to RHCE | Achieves ambient |
| R52 | S | 62 [2] | 66 | 57 | 11 | 2 | 4 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| | E | 56 [2] | 63 | 57 | 8 | 2 | 7 | 1 | 3 m PLB adjacent to RHCE | Achieves ambient |
| R54 | E | 62 [2] | 68 | 59 | 13 | 4 | 6 | - | 3 m PLB adjacent to RHCE | Achieves ambient |
| S8-L3/R55 | S | 62 [2] | 67 | 61 | 12 | 6 | 5 | - | 2.4 m PLB adjacent to RHCE | Achieves ambient |
| | E | 62 [2] | 63 | 59 | 8 | 4 | 1 | - | 2 m PLB adjacent to RHCE | Achieves ambient |
| S8-L4/R50 | S | 50 | 54 | 54 | - | - | 4 | 4 | No Mitigation | Mitigation Not Required |

Notes:

[1] PLB is a residential property line barrier.

[2] Ambient exceeds 55 dBA provincial objective.

- Shaded areas represent impacts at green spaces not considered as Noise Sensitive Areas by MOE/MTO guidelines, and which do not strictly require mitigation.

Table 5.2.2: Impact (Change Assessment) With No Mitigation

| Segment Name | Start/End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | Future Build SL Excess Over Future No-Build SL (dB) |
|---|-----------|--------------------------|---------------------------------|---|
| High Impact: Greater than 15 dB Increase | | | | |
| S4-L2 | S/E | 45 | 70 | 25 |
| S7-L6/R31 | S | 48 | 68 | 20 |
| | E | 48 | 67 | 19 |
| S5-L1/ R1 | E | 45 | 64 | 19 |
| S5-L2/R2 | S | 45 | 64 | 19 |
| S5-L4/R4 | S | 45 | 64 | 19 |
| S5-L4/R4 | E | 45 | 64 | 19 |
| S5-L1/ R1 | S | 45 | 63 | 18 |
| S4-L1 | E | 45 | 62 | 17 |
| S4-L3 | S | 45 | 62 | 17 |
| S5-L6 | E | 45 | 62 | 17 |
| S4-L1 | S | 45 | 61 | 16 |
| Significant Impact: 11 to 15 dB Increase | | | | |
| S8-L1/R40 | S | 50 | 65 | 15 |
| S5-L8 | S | 48 | 62 | 14 |
| S6-L1/R6 | E | 52 | 66 | 14 |
| S6-L5 | E | 52 | 65 | 13 |
| R12 | E | 52 | 65 | 13 |
| S1-L4 | S | 52 | 64 | 12 |
| S5-L2/R2 | E | 45 | 57 | 12 |
| S5-L3/R3 | E | 45 | 57 | 12 |
| S5-L9 | E | 48 | 60 | 12 |
| S6-L7 | S | 52 | 64 | 12 |
| S1-L2 | E | 52 | 63 | 11 |
| S5-L8 | E | 48 | 59 | 11 |
| S6-L6/R16 | S | 52 | 63 | 11 |
| S6-L6/R16 | E | 52 | 63 | 11 |
| S6-L7 | E | 52 | 63 | 11 |
| S6-L8 | S | 52 | 63 | 11 |

Table 5.2.2 cont'd: Impact (Change Assessment) With No Mitigation

| Segment Name | Start/End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | Future Build SL Excess Over Future No-Build SL (dB) |
|---|-----------|--------------------------|---------------------------------|---|
| S7-L1 | S | 52 | 63 | 11 |
| Minor Impact: 6 to 10 dB Increase | | | | |
| S5-L10 | S | 48 | 58 | 10 |
| S6-L5 | S | 52 | 62 | 10 |
| S6-L1/R6 | S | 52 | 61 | 9 |
| S7-L5 | S | 50 | 59 | 9 |
| S7-L7 | S | 48 | 57 | 9 |
| S1-L5 | S | 52 | 60 | 8 |
| R14 | S | 52 | 60 | 8 |
| S8-L2/R41 | S | 56 [1] | 64 | 8 |
| S5-L5/R5 | S | 45 | 52 | 7 |
| S5-L9 | S | 48 | 55 | 7 |
| S6-L3/R8 | S | 52 | 59 | 7 |
| R12 | S | 52 | 59 | 7 |
| R52 | E | 56 [1] | 63 | 7 |
| S1-L1 | S | 52 | 58 | 6 |
| R54 | E | 62 [1] | 68 | 6 |
| Barely Noticeable Impact: 4 to 5 dB Increase | | | | |
| S1-L4 | E | 52 | 57 | 5 |
| R14 | E | 52 | 57 | 5 |
| S7-L2/R20 | S | 52 | 57 | 5 |
| S7-L2/R20 | E | 58 [1] | 63 | 5 |
| S8-L1/R40 | E | 56 [1] | 61 | 5 |
| S8-L3/R55 | S | 62 [1] | 67 | 5 |
| S5-L7 | S | 48 | 52 | 4 |
| R52 | S | 62 [1] | 66 | 4 |
| S8-L4/R50 | S | 50 | 54 | 4 |
| Negligible Impact: 0 to 3 dB Increase | | | | |
| R15 | E | 52 | 55 | 3 |
| S7-L3/R21 | S | 58 [1] | 59 | 1 |

Table 5.2.2 cont'd: Impact (Change Assessment) With No Mitigation

| Segment Name | Start/End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | Future Build SL Excess Over Future No-Build SL (dB) |
|--------------|-----------|--------------------------|---------------------------------|---|
| S7-L4/R22 | S | 64 | 65 | 1 |
| S7-L4/R22 | E | 63 | 64 | 1 |
| S8-L3/R55 | E | 62 [1] | 63 | 1 |
| S1-L1 | S | 52 | 51 | - |
| S1-L2 | S | 52 | 52 | - |
| S1-L6 | S | 50 | 50 | - |

Notes:

[1] Ambient exceeds 55 dBA provincial objective.

Table 5.2.3: Impact (Change Assessment) With Mitigation

| Segment Name | Start/End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | Future Build SL Excess Over Future No-Build SL (dB) |
|---|-----------|--------------------------|---------------------------------|---|
| Significant Impact: 10 to 14 dB Increase | | | | |
| S4-L2 | S/E | 45 | 58 | 13 |
| S5-L6 | E | 45 | 58 | 13 |
| S5-L1/R1 | E | 45 | 56 | 11 |
| S5-L2/R2 | S | 45 | 56 | 11 |
| Minor Impact: 6 to 10 dB Increase | | | | |
| S5-L4/R4 | S | 45 | 55 | 10 |
| S7-L6/R31 | E | 48 | 58 | 10 |
| S5-L4/R4 | E | 45 | 54 | 9 |
| S5-L8 | S | 48 | 57 | 9 |
| S7-L6/R31 | S | 48 | 57 | 9 |
| S4-L1 | E | 45 | 53 | 8 |
| S6-L1/R6 | E | 52 | 59 | 7 |
| S4-L3 | S | 45 | 53 | 8 |
| S5-L1/R1 | S | 45 | 53 | 8 |
| S4-L1 | S | 45 | 52 | 7 |
| S5-L2/R2 | E | 45 | 52 | 7 |
| S5-L3/R3 | E | 45 | 52 | 7 |
| S6-L7 | S | 52 | 59 | 7 |
| S8-L1/R40 | S | 50 | 56 | 6 |
| Barely Noticeable Impact: 4 to 5 dB Increase | | | | |
| S1-L4 | S | 52 | 57 | 5 |
| S1-L4 | E | 52 | 57 | 5 |
| S6-L7 | E | 52 | 57 | 5 |
| S7-L1 | S | 52 | 57 | 5 |
| S7-L5 | S | 50 | 55 | 5 |
| S7-L7 | S | 48 | 53 | 5 |
| S1-L2 | E | 52 | 56 | 4 |
| S1-L5 | S | 52 | 56 | 4 |
| S6-L1/R6 | S | 52 | 56 | 4 |
| S8-L4/R50 | S | 50 | 54 | 4 |

Table 5.2.3 cont'd: Impact (Change Assessment) With Mitigation

| Segment Name | Start/End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | Future Build SL Excess Over Future No-Build SL (dB) |
|--|-----------|--------------------------|---------------------------------|---|
| Negligible Impact: 0 to 3 dB Increase | | | | |
| S5-L9 | E | 48 | 51 | 3 |
| S5-L10 | S | 48 | 51 | 3 |
| R12 | E | 52 | 55 | 3 |
| R14 | S | 52 | 55 | 3 |
| R15 | E | 52 | 55 | 3 |
| S5-L5/R5 | S | 45 | 47 | 2 |
| R12 | S | 52 | 54 | 2 |
| S1-L1 | S | 52 | 53 | 1 |
| S6-L5 | S | 52 | 53 | 1 |
| R14 | E | 52 | 53 | 1 |
| S6-L6/R16 | S | 52 | 53 | 1 |
| S6-L6/R16 | E | 52 | 53 | 1 |
| S6-L8 | S | 52 | 53 | 1 |
| S8-L1/R40 | E | 56 [1] | 57 | 1 |
| S8-L2/R41 | S | 56 [1] | 57 | 1 |
| R52 | E | 56 [1] | 57 | 1 |
| S1-L1 | E | 52 | 51 | - |
| S1-L2 | S | 52 | 52 | - |
| S1-L6 | S | 50 | 50 | - |
| S5-L7 | S | 48 | 48 | - |
| S5-L8 | E | 48 | 48 | - |
| S5-L9 | S | 48 | 48 | - |
| S6-L3/R8 | S | 52 | 52 | - |
| S7-L2/R20 | S | 52 | 48 | - |
| S7-L2/R20 | E | 58 [1] | 53 | - |
| S7-L3/R21 | S | 58 [1] | 51 | - |
| S7-L4/R22 | S | 64 | 64 | - |
| S7-L4/R22 | E | 63 | 63 | - |
| R52 | S | 62 [1] | 57 | - |
| R54 | E | 62 [1] | 59 | - |

Table 5.2.3 cont'd: Impact (Change Assessment) With Mitigation

| Segment Name | Start/End | Future No-Build SL (dBA) | Projected Future Build SL (dBA) | Future Build SL Excess Over Future No-Build SL (dB) |
|--------------|-----------|-----------------------------|------------------------------------|---|
| S8-L3/R55 | S | 62 [1] | 61 | - |
| S8-L3/R55 | E | 62 [1] | 59 | - |

Notes:

[1] Ambient exceeds 55 dBA provincial objective.

Legend:

- 1● Long-Duration Monitoring Site
- A● Short-Duration Monitoring Site (Green Space)



**Ambient Noise Measurement Locations
Red Hill Creek Expressway North/South Corridor**

Red Hill Creek Expressway EA - Hamilton, Ont.

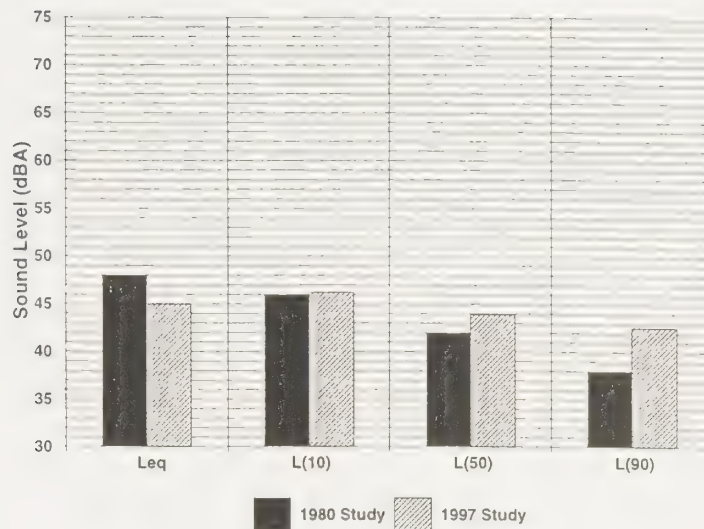


Drawn by: DJM Figure: 1.1
Scale: 1:50,000
Date: Oct. 16, 1997

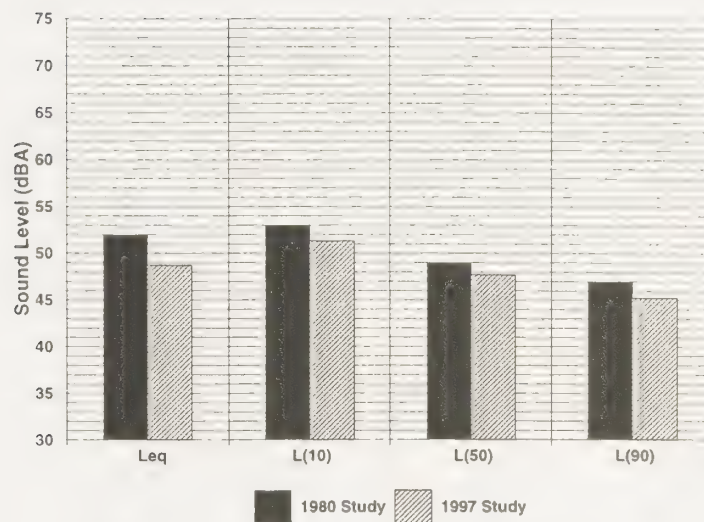
Job No. 97-207

RWDI

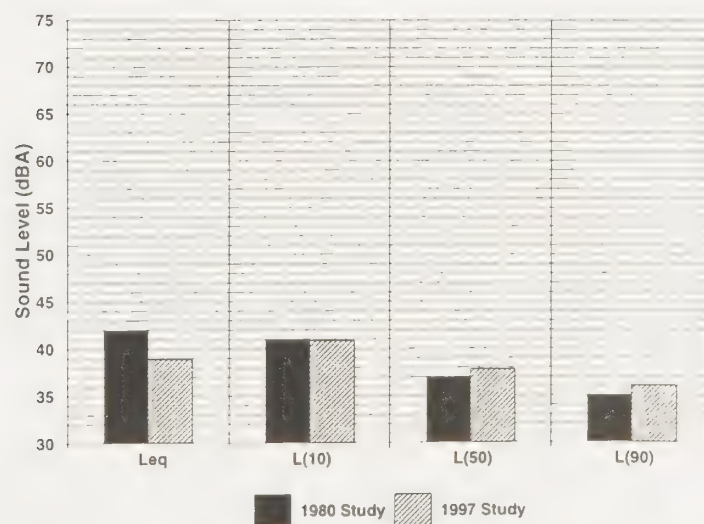
Site 7 - 32 Jamie Anne Cr.



Site 8 - 108 Albion Falls Blvd.



Site 9 - 64 Forest Hill Cr.



**Differences Between 1980 Measurement Data
And Short-Duration Measurement Results**
Sites 7, 8, and 9

Red Hill Creek Expressway EA - Hamilton, Ont.

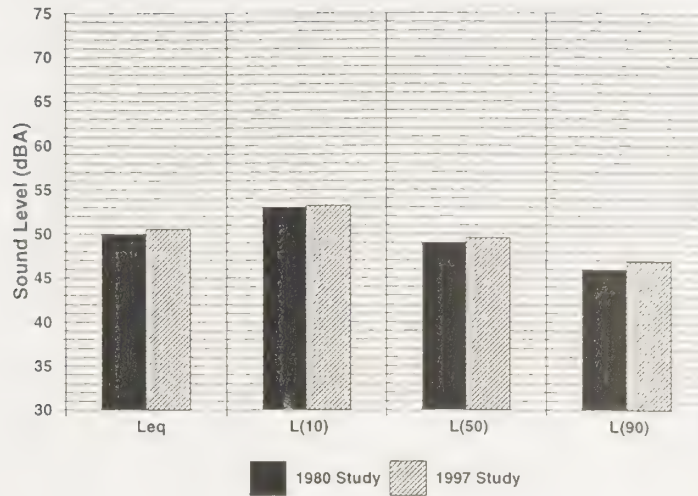
Job No. 97-207-09

Figure No. 4.1.1

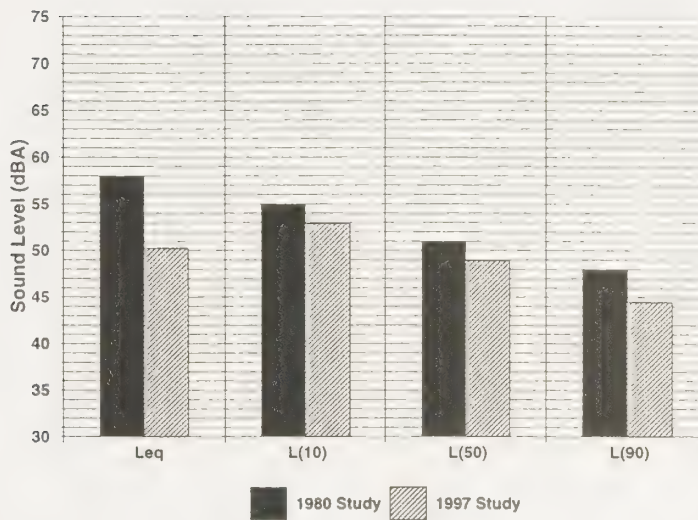
Date: 07/Oct/97

RWDI

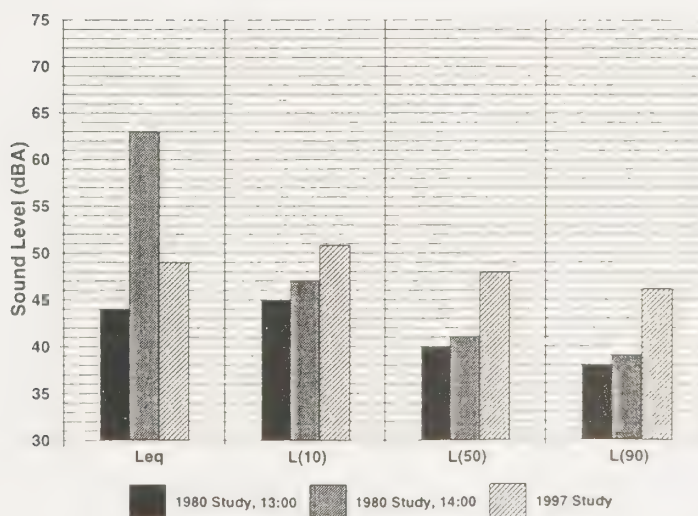
Site 10 - 21 Beland Ct.



Site 11 - 3 Cherry Road



Site 12 - 255 Pottruff Rd.



Differences Between 1980 Measurement Data And Short-Duration Measurement Results Sites 10, 11, and 12

Red Hill Creek Expressway EA - Hamilton, Ont.

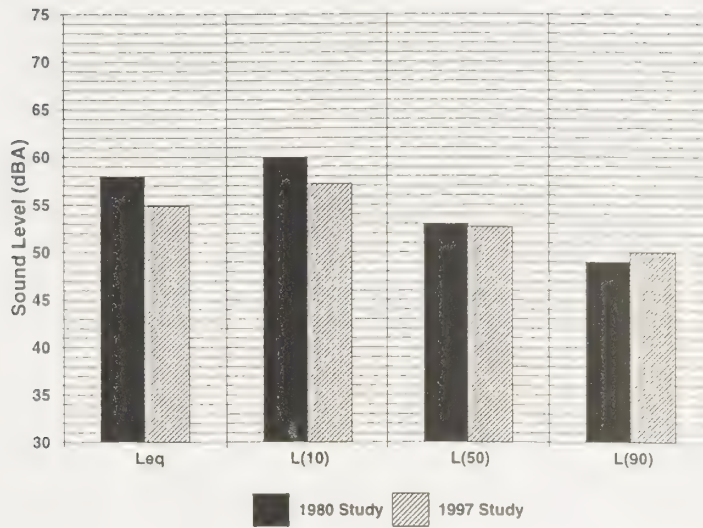
Job No. 97-207-09

Figure No. 4.1.2

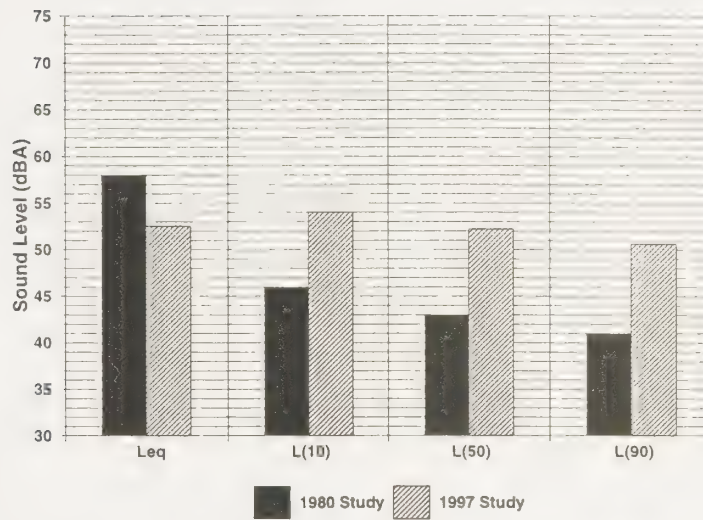
Date: 07/Oct/97

RWDI

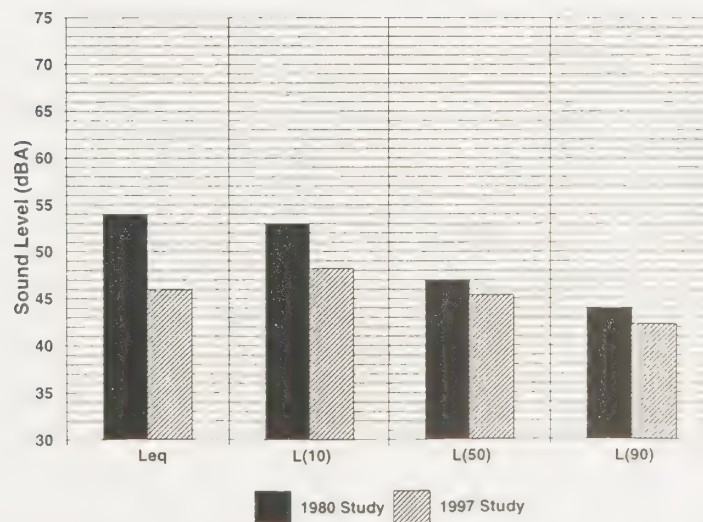
Site 13 - 350 Potruff Road



Site 14 - 21 Embury Ct.



Site 15 - 36 Sinclair Rd.



**Differences Between 1980 Measurement Data
And Short-Duration Measurement Results**
Sites 13, 14, and 15

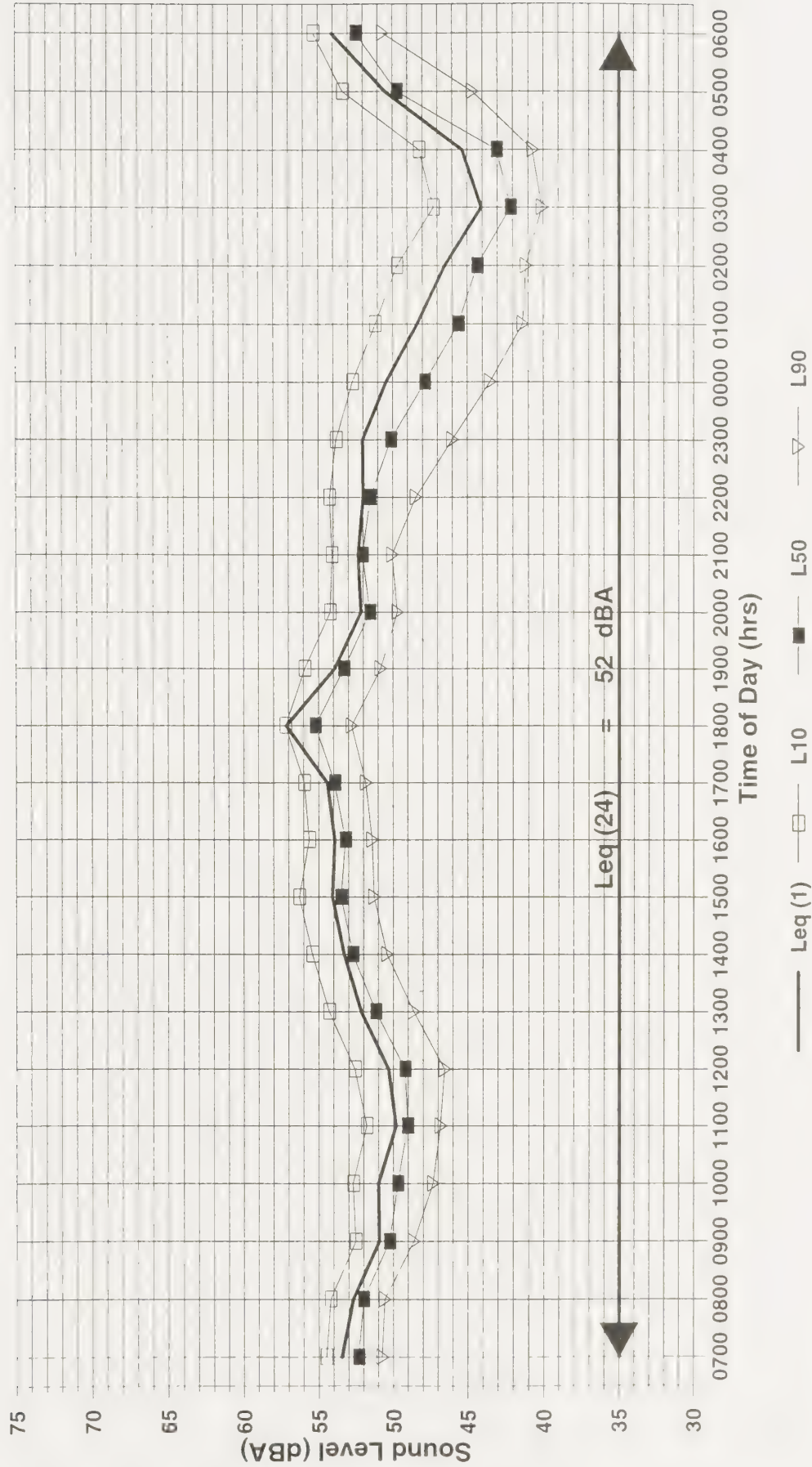
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.1.3

Date: 07/Oct/97

RWDI



Notes:

- Measurements taken from 1700h, April 2, 1997 to 1300h, April 4, 1997
- Results presented herein are the linear average of two days with the exception of 1400 to 1600h, which are the measurements from April 3, 1997 only.

Average Sound Exposure In Each Hour
Site 1 - 239 Upper Mt. Albion Rd.

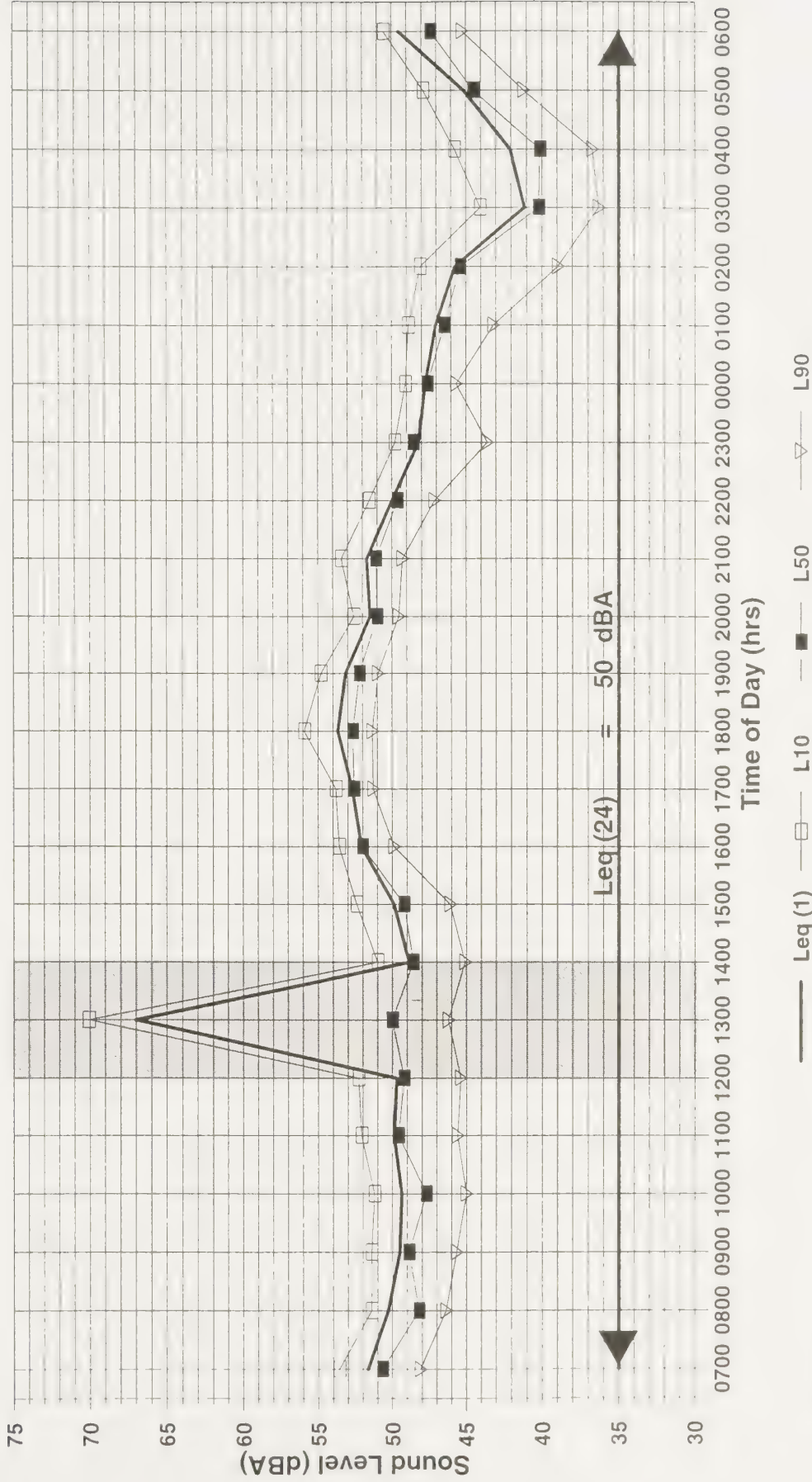
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.1

Date: 07/Oct/97

RWDI



Notes:

- Measurements taken from 1800h, July 30, 1997 to 0800h, August 1, 1997
- Results presented herein are the linear average of two days with the exception of 0800 to 1700h, which are the measurements from July 31, 1997 only.
- Shaded area represents possible spurious data point that has been excluded in the calculation of the Leq (24) value.

**Average Sound Exposure In Each Hour
Site 2 - 10 Tamwood Cr.**

Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

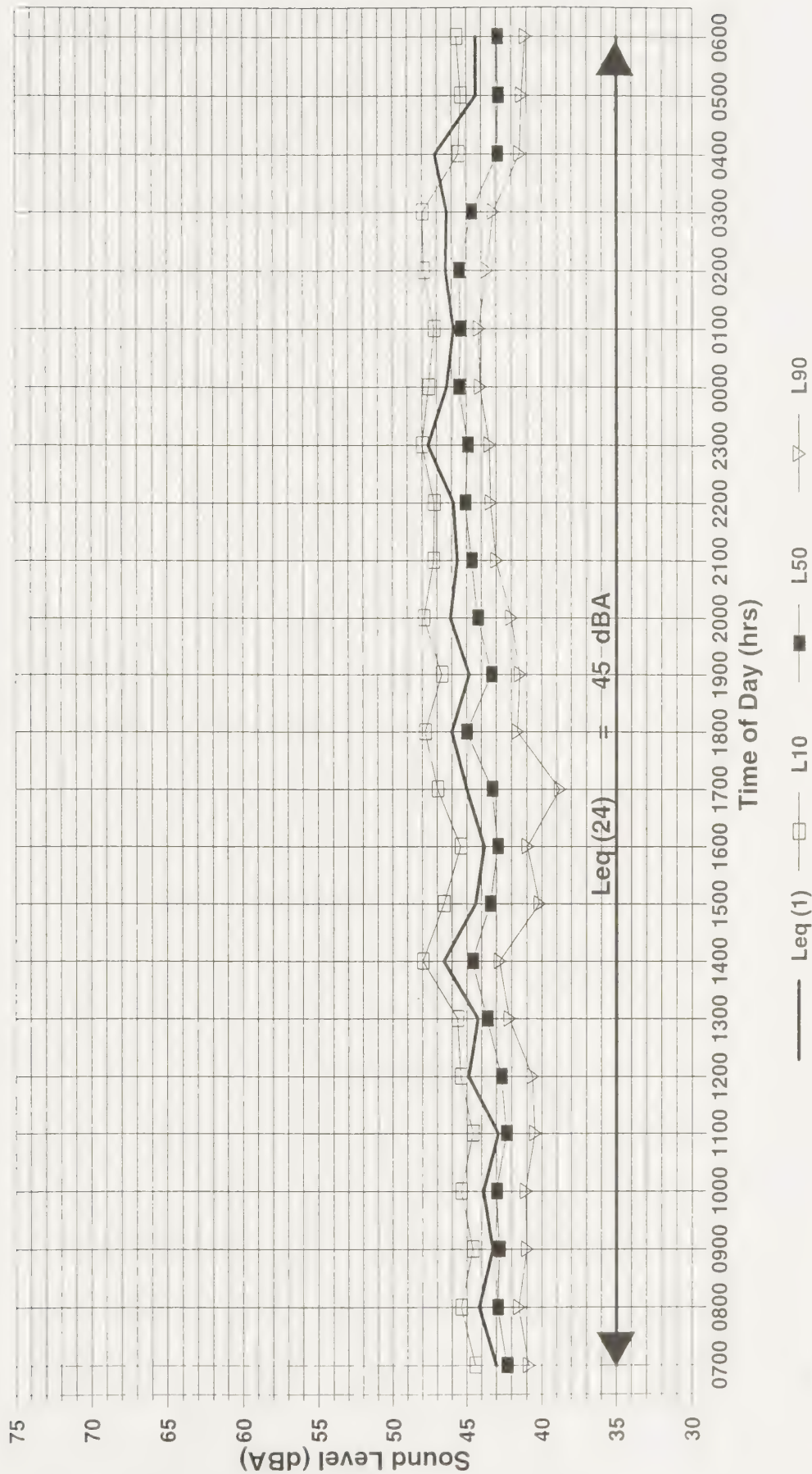
Figure No.

4.2.2

Date:

07/Oct/97

RWDI



Notes:

- Measurements taken from 1400h, August 1, 1997 to 0800h, August 6, 1997.
- Measurements from August 4 have been excluded from this average due to contamination from a backyard party held near the measurement site over much of the day.
- Results presented herein are the linear average of four days (Aug. 2, 3, 5, and Aug 1 and 6 where appropriate) with the exception of 0800 to 1400h, which are an average of three days only (Aug. 2, 3, and 5).

**Average Sound Exposure In Each Hour
Site 3 - 74 Brookstream Ct.**

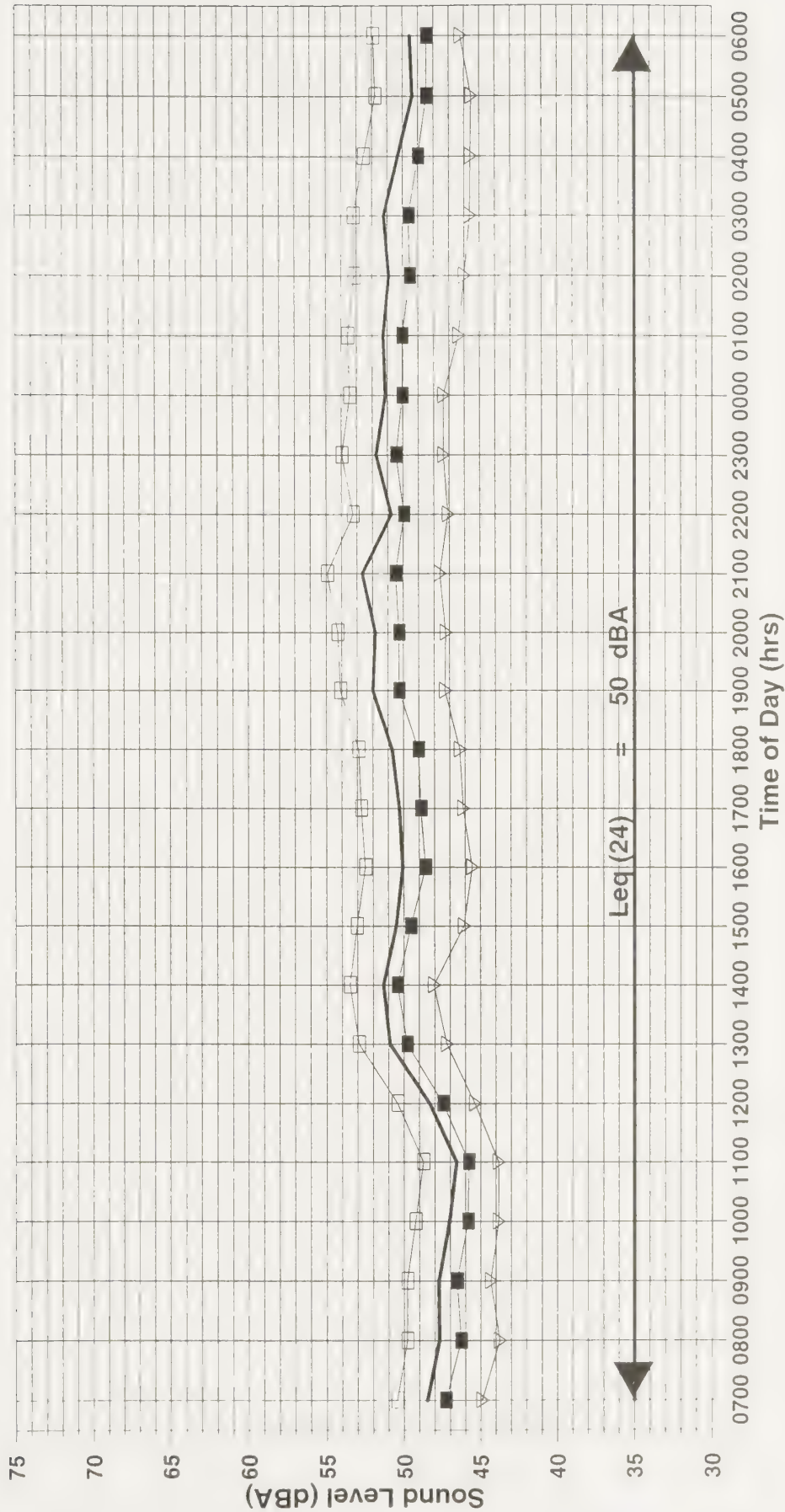
Figure No. 4.2.3

Job No. 97-207-09

Red Hill Creek Expressway EA - Hamilton, Ont.

Date: 07/Oct/97

RWDI



Notes:

- Measurements taken from 1300h, August 6, 1997 to 1300h, August 8, 1997
- Results presented herein are the linear average of two complete days.

**Average Sound Exposure In Each Hour
Site 4 - 396 Queenston Blvd.**

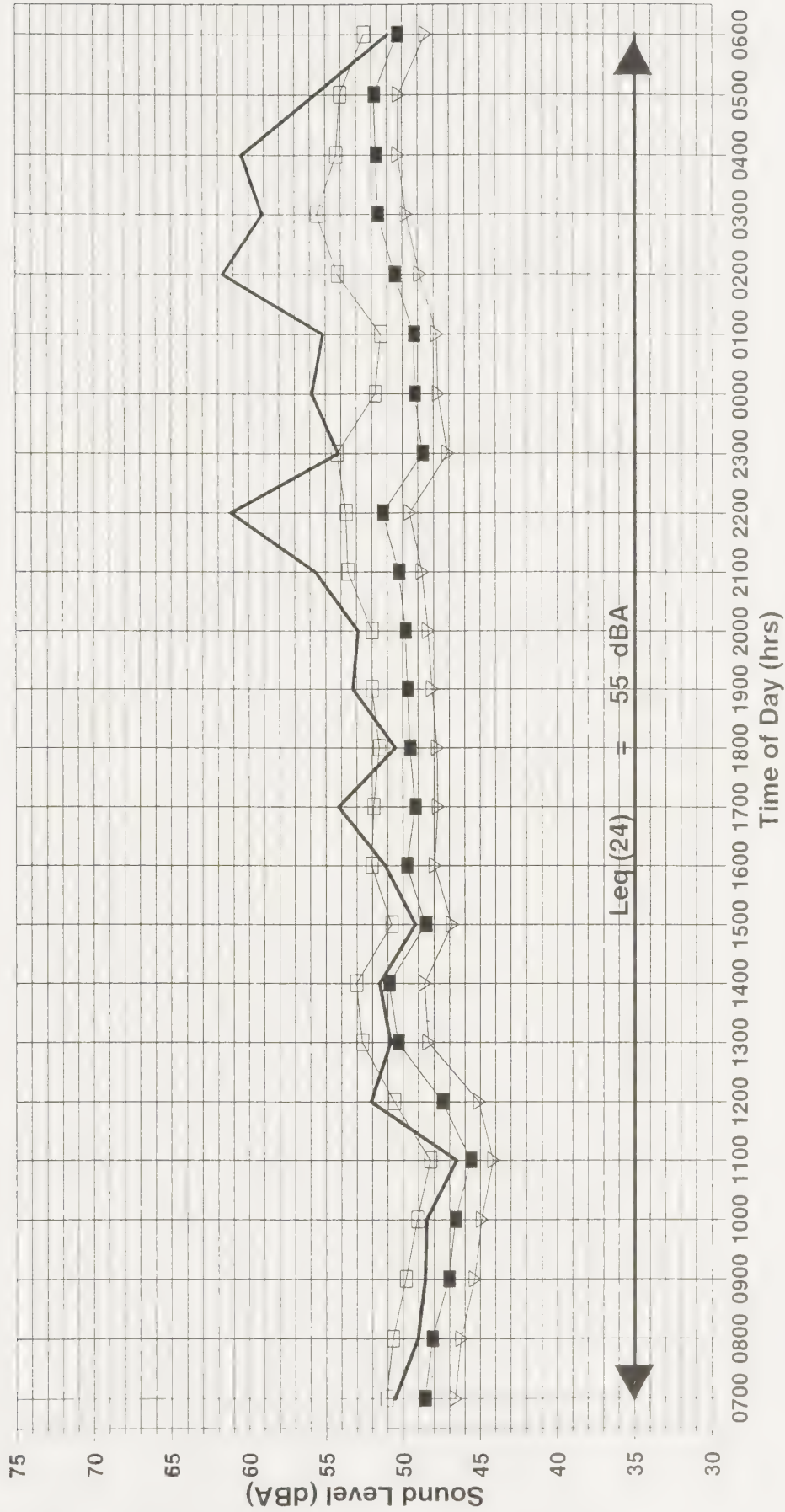
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.4

Date: 07/Oct/97

RWDI



Notes:

- Measurements taken from 1600h, August 18, 1997 to 1600h, August 20, 1997
- Results presented herein are the linear average of two complete days.

**Average Sound Exposure in Each Hour
Site 5 - 12 Armstrong Ave.**

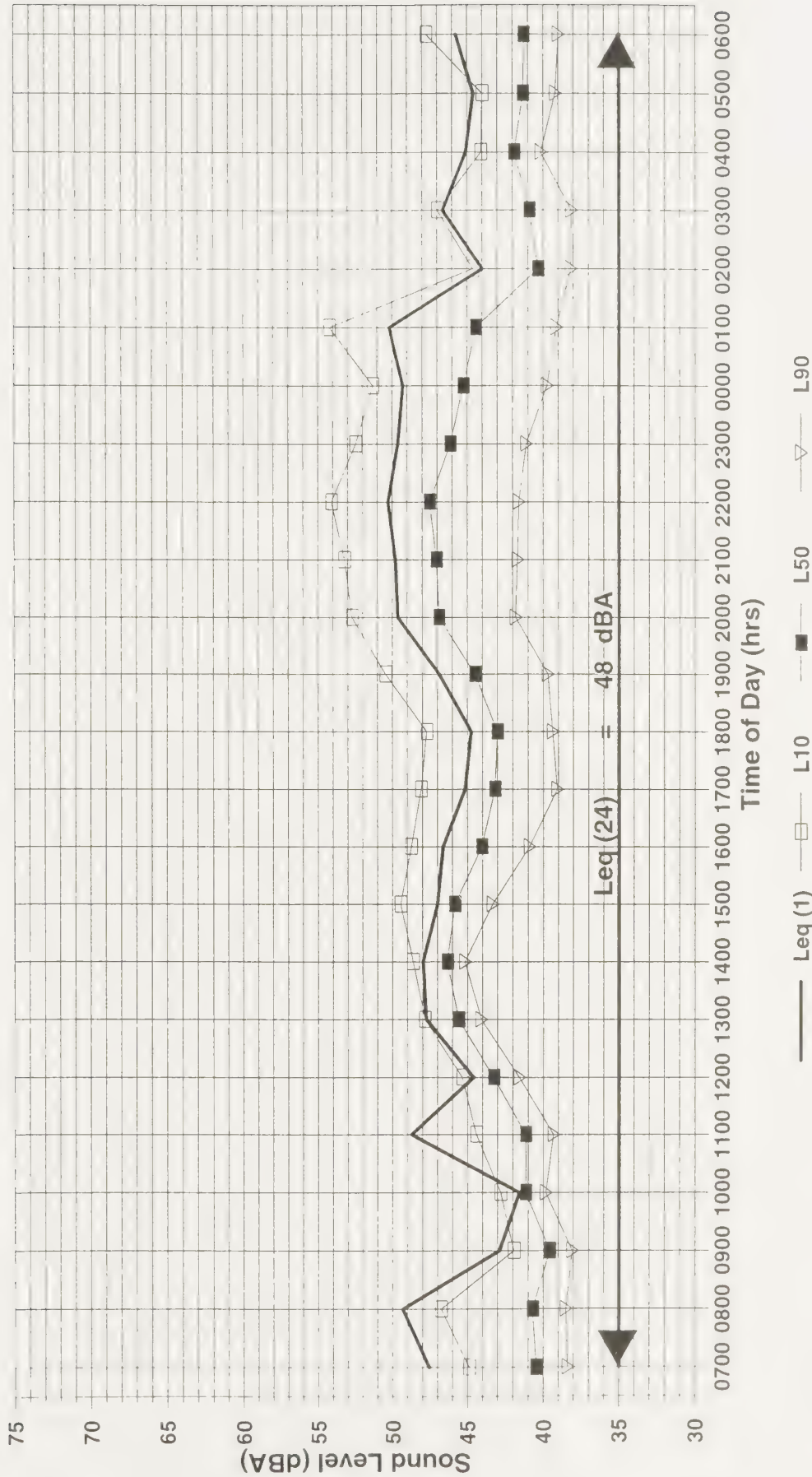
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.5

Date: 07/Oct/97

RWDI



Notes:

- Measurements taken from 1600h, August 13, 1997 to 1500h, August 15, 1997
- Results presented herein are the linear average of two days with the exception of 1500h, which is the measurement from August 14, 1997 only.

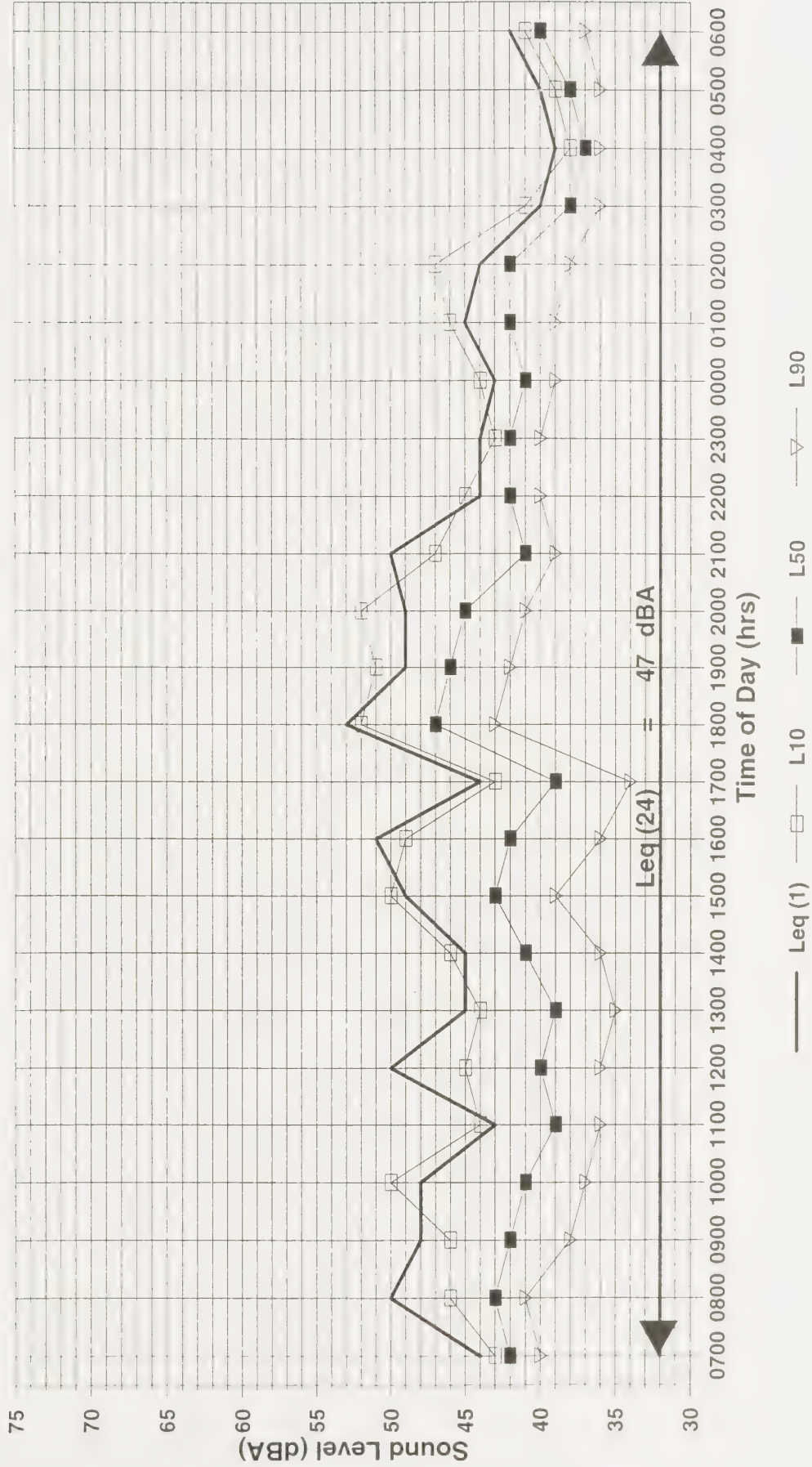
Average Sound Exposure In Each Hour
Site 6 - 20 Parklands Dr.

Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

| | |
|------------|-----------|
| Figure No. | 4.2.6 |
| Date: | 07/Oct/97 |

RWDI



Average Sound Exposure In Each Hour
Site 7-32 Jamie Anne Cr.

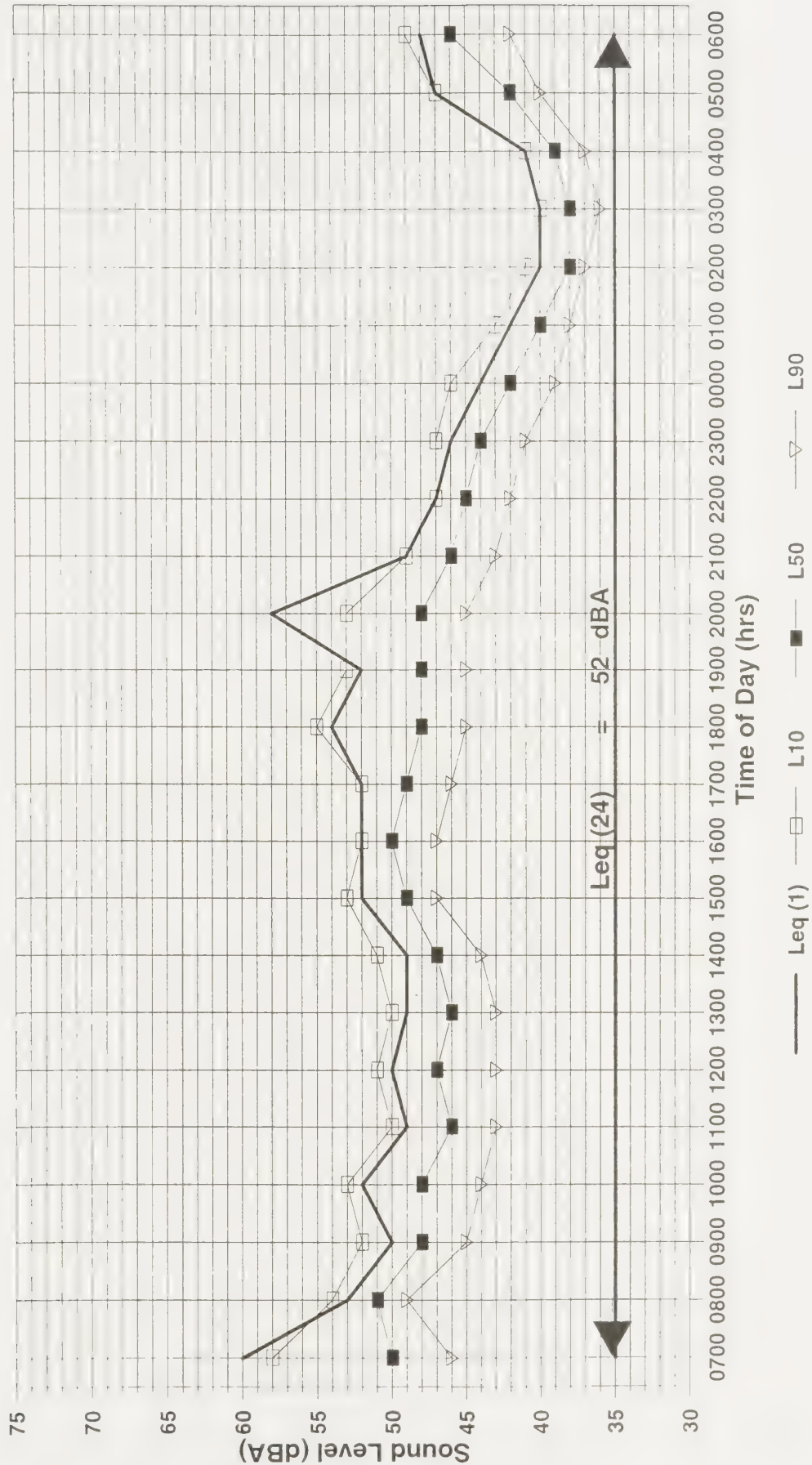
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.7

Date: 07/Oct/97

RWDI



Average Sound Exposure In Each Hour
Site 8 - 108 Albion Falls Blvd.

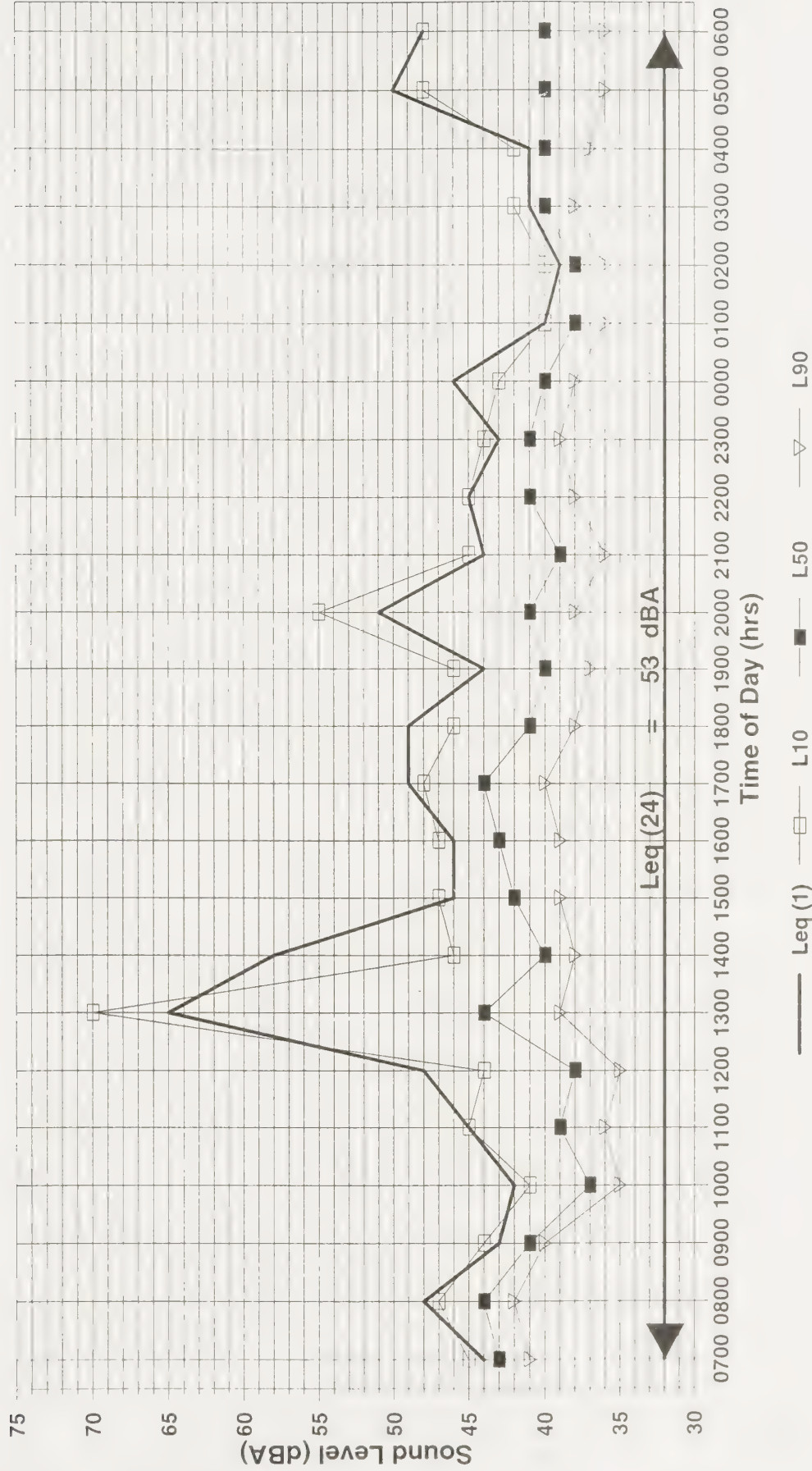
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.8

Date: 07/Oct/97

RWDI



Average Sound Exposure in Each Hour Site 9 - 64 Forest Hill Cr.

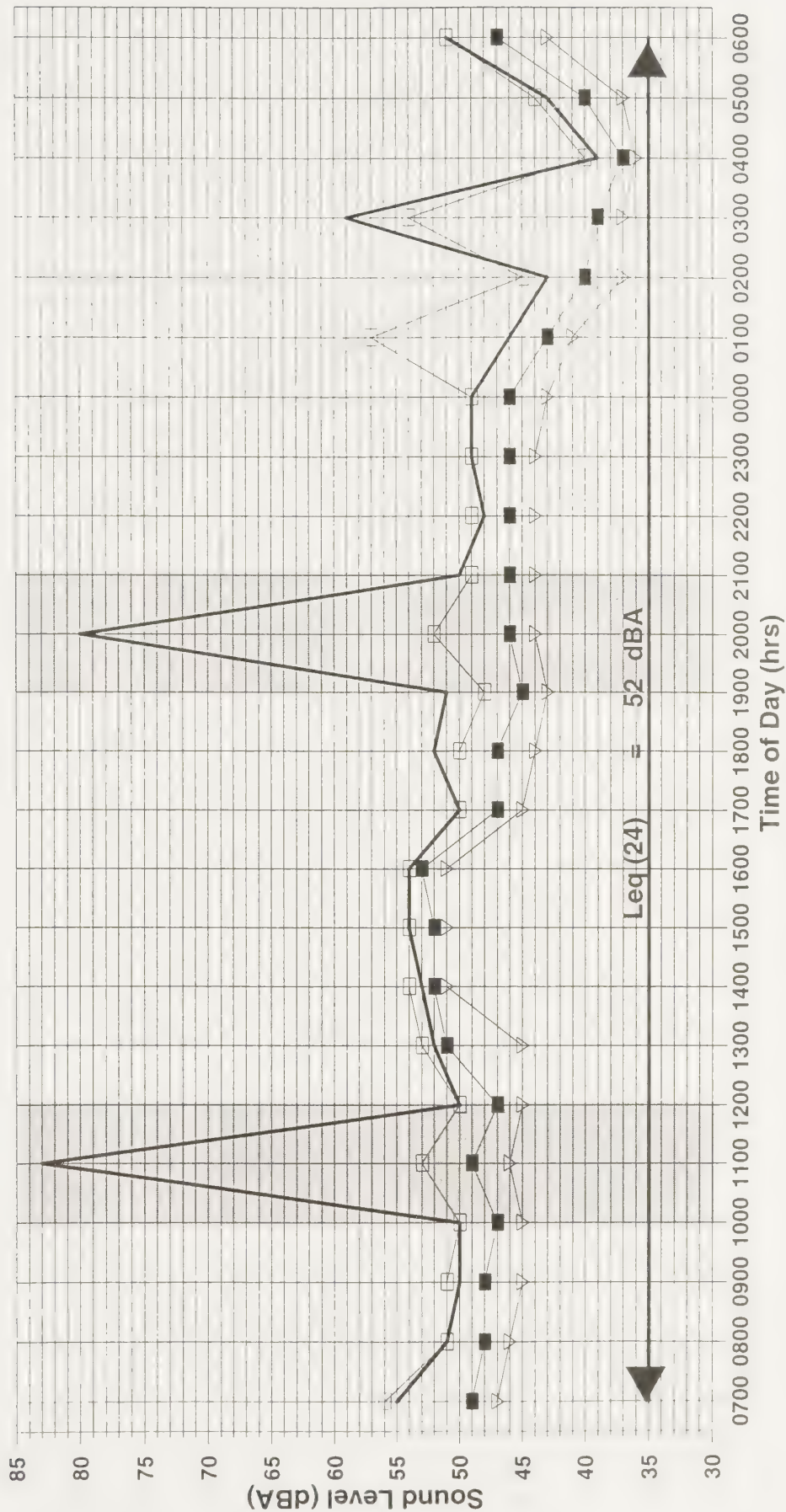
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.9

Date: 07/Oct/97

RWDI



Notes:

Shaded area represents spurious data points due to high-intensity, transient events which do not reflect the normal ambient. These points have been excluded in the calculation of the Leq (24) value.

Average Sound Exposure In Each Hour Site 10 - 21 Beland Ct.

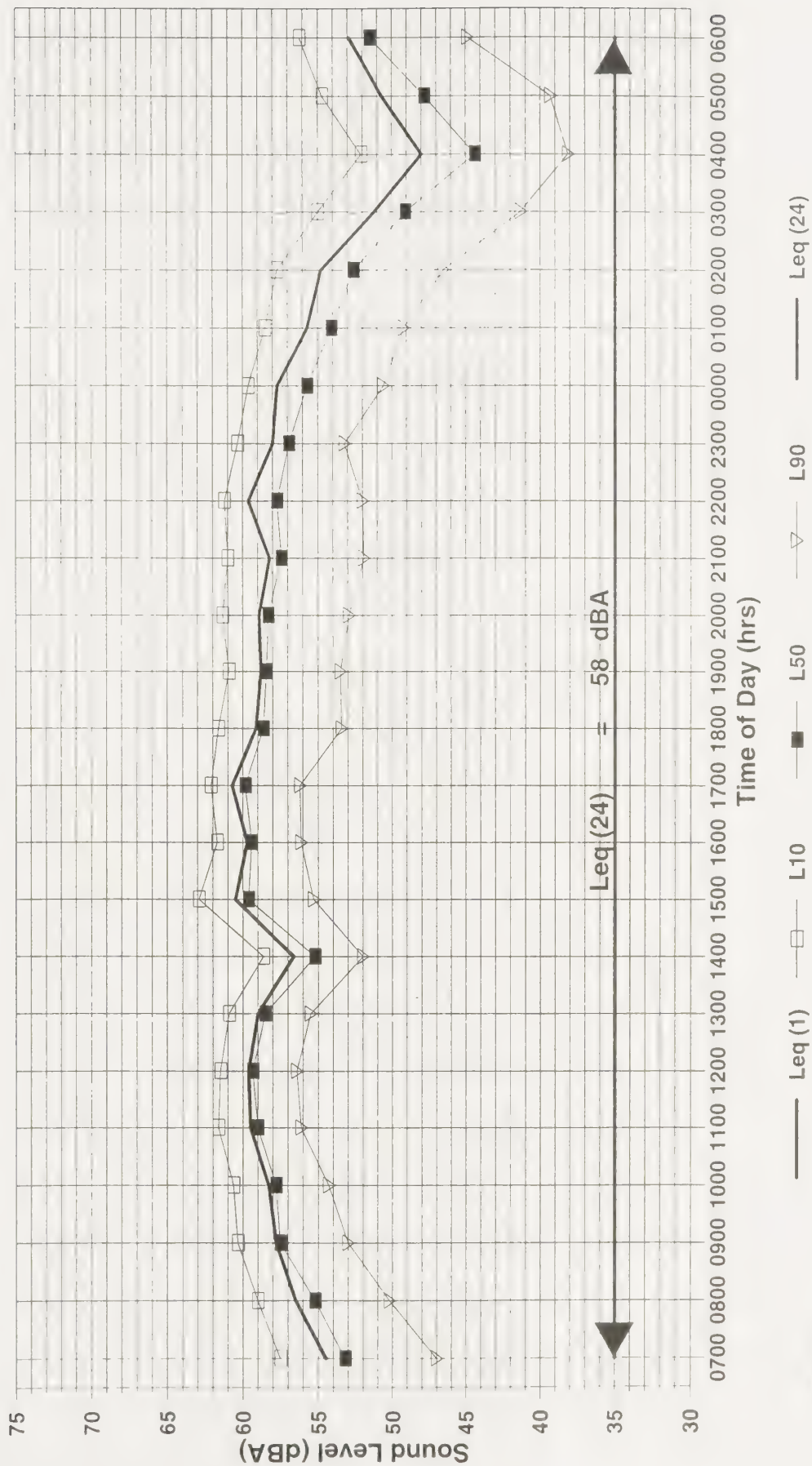
Figure No. 4.2.10

Date: 07/Oct/97

Job No. 97-207-09

Red Hill Creek Expressway EA - Hamilton, Ont.

RWDI



Notes:

- Measurements taken from 1500h, October 3, 1997 to 1400h, October 4, 1997

Average Sound Exposure In Each Hour Site 11 - 3 Cherry Rd.

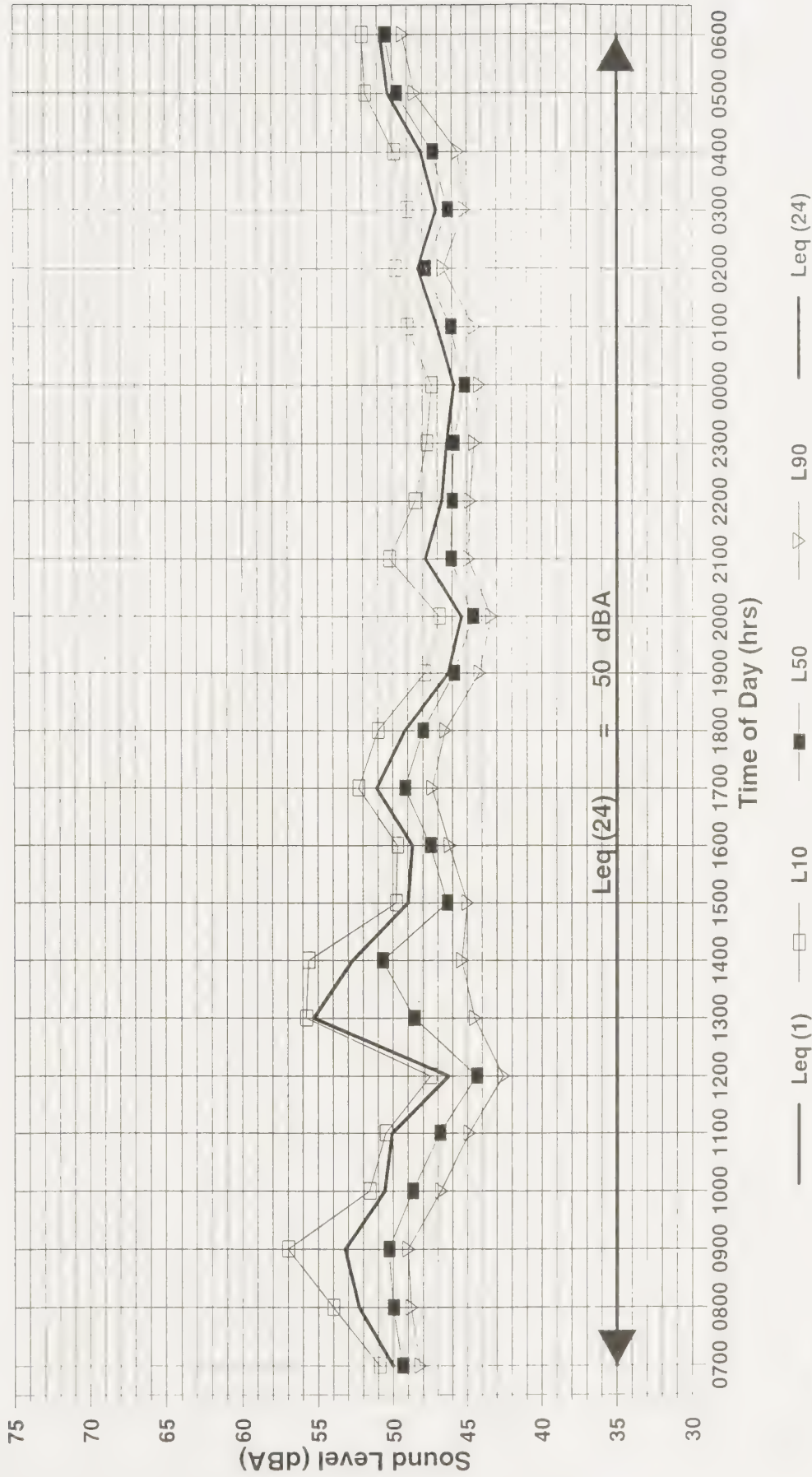
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.11

Date: 07/Oct/97

RWDI



Notes:

- Measurements taken from 1300h, October 2, 1997 to 1200h, October 3, 1997

**Average Sound Exposure In Each Hour
Site 12 - 255 Pottruff Rd.**

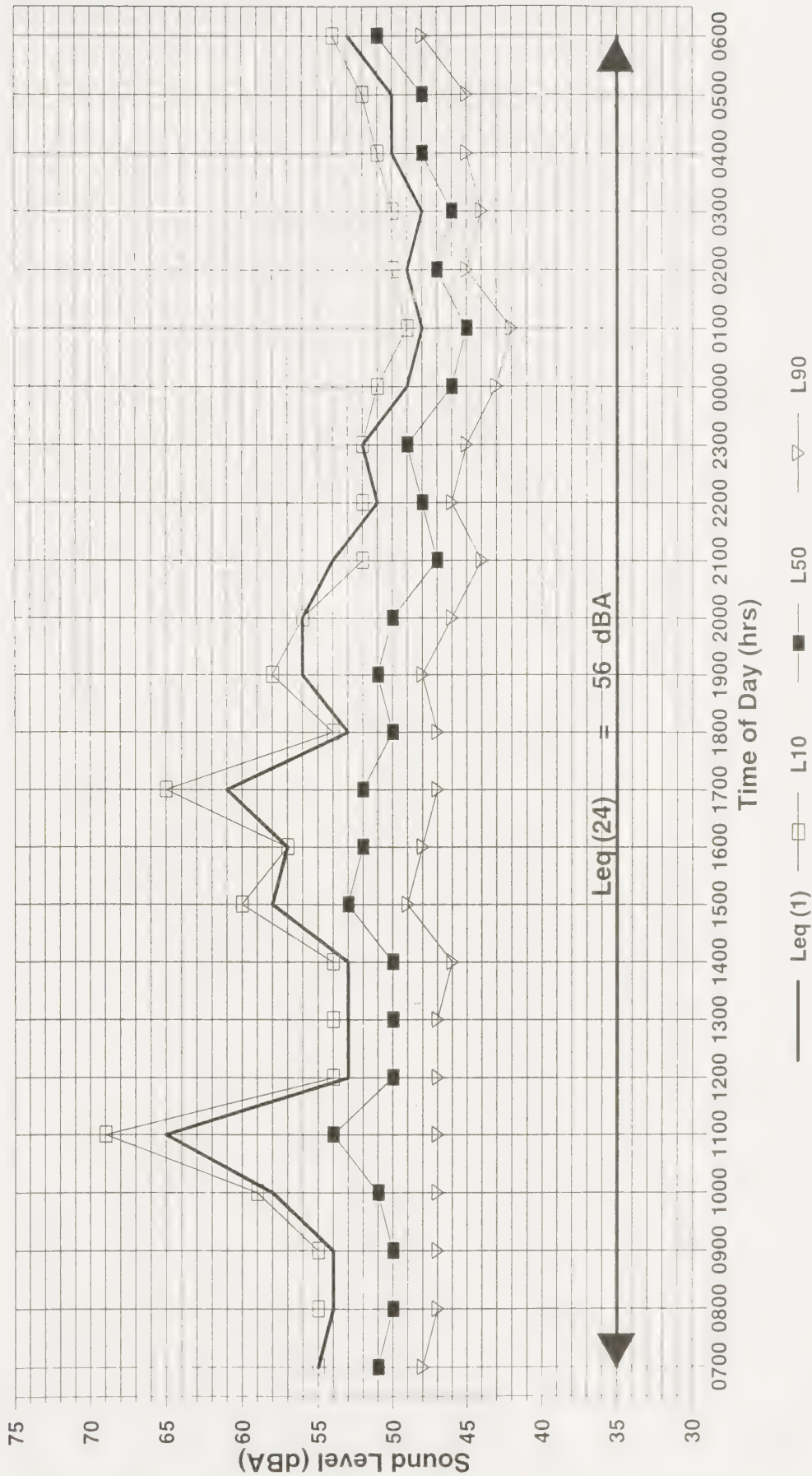
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.12

Date: 07/Oct/97





**Average Sound Exposure In Each Hour
Site 13 - 350 Pottruff Rd.**

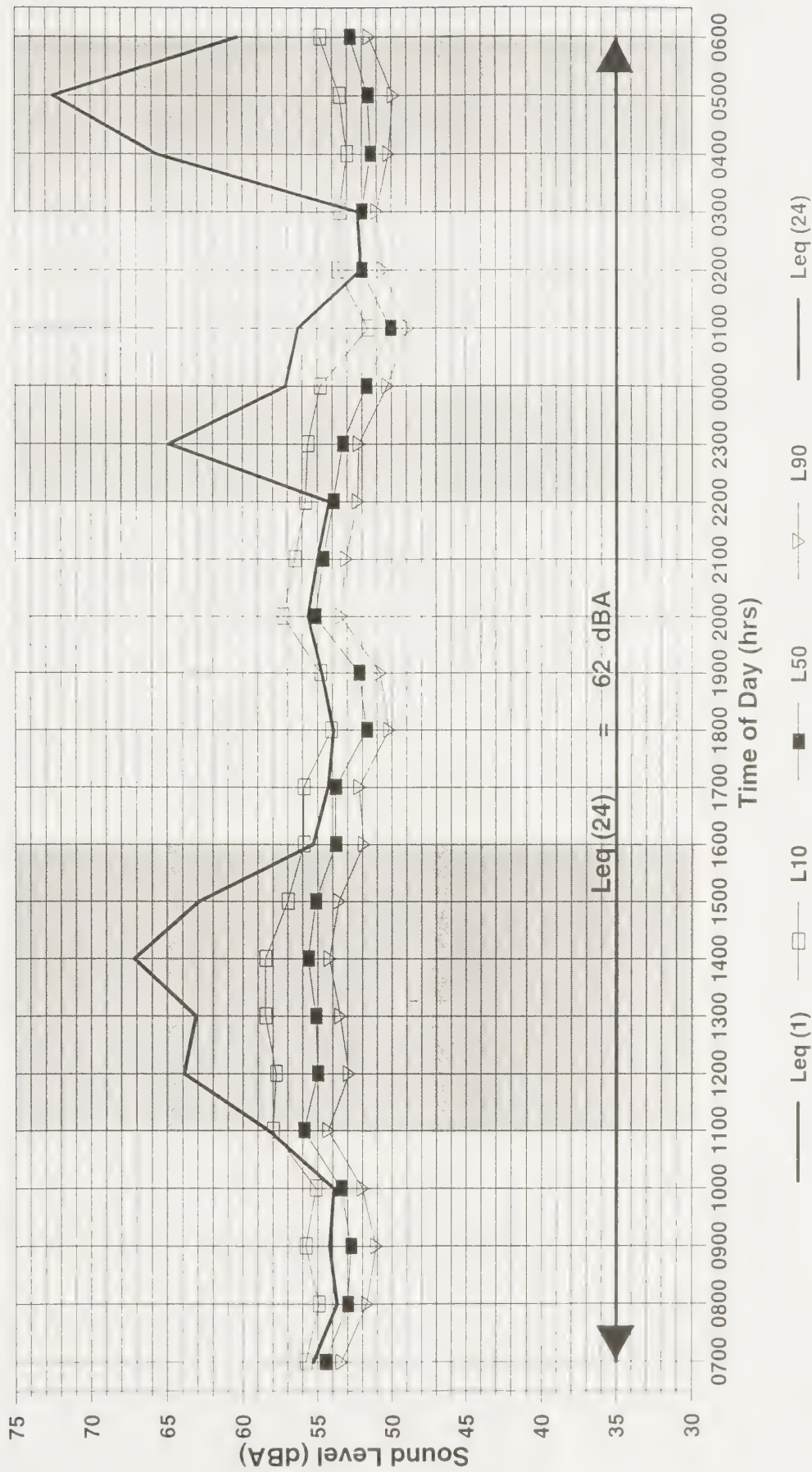
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.13

Date: 07/Oct/97

RWDI



Notes:

- Measurements taken from 1100h, October 1, 1997 to 1000h, October 2, 1997
- Shaded areas represent high level transient events (train pass-bys). This data was included in the Leq(24) calculation for this location.

Average Sound Exposure In Each Hour
Site 14 - 21 Embury Ct.

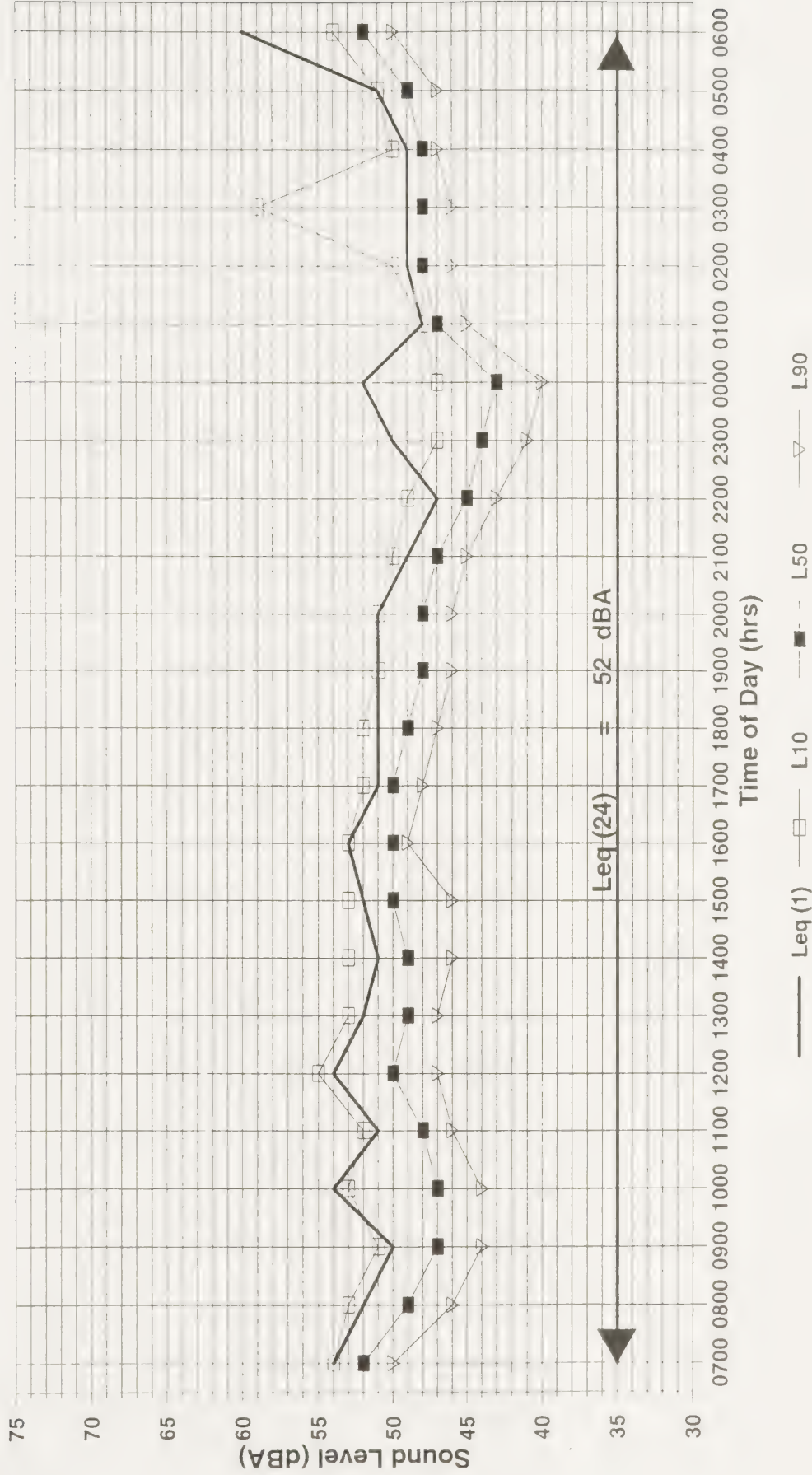
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.14

Date: 07/Oct/97

RWDI



Average Sound Exposure in Each Hour
Site 15 - 36 Sinclair Rd.

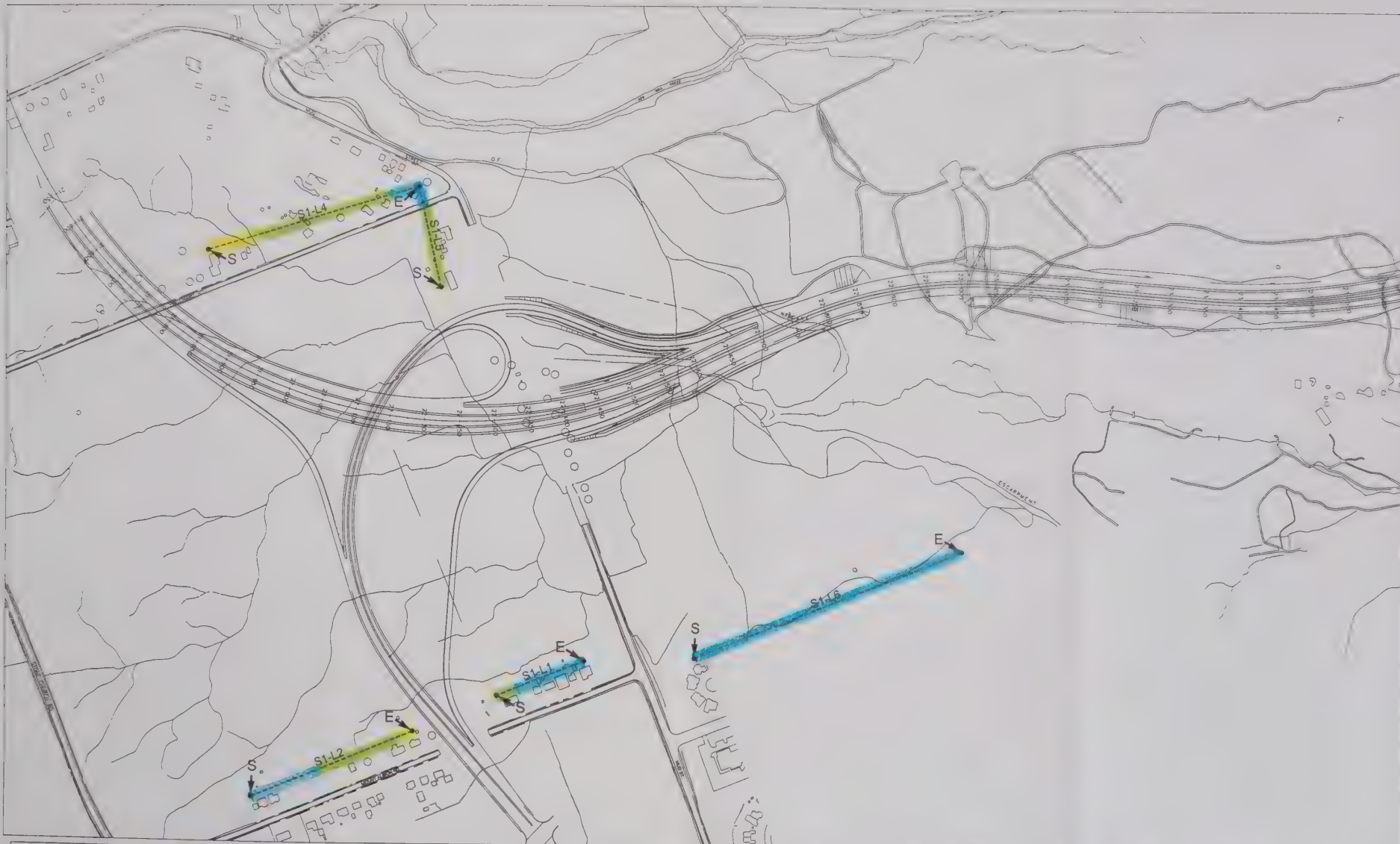
Red Hill Creek Expressway EA - Hamilton, Ont.

Job No. 97-207-09

Figure No. 4.2.15

Date: 07/Oct/97

RWDI



| | | |
|--|-------|------|
| Unmitigated Impact, dB Excess over Future "No Build" | 0-5 | 6-10 |
| | 11-15 | >15 |

Predicted Noise Impact - Without Mitigation - Pritchard Road to Mount Albion Road

Red Hill Creek Expressway IADP - Hamilton, Ont.

True North



Drawn by: DJM Figure: 5.1

Approx. Scale: 1:5000

Job No. 97-207

Date Revised: May 20, 1998

RWDI



| | | | | |
|--|-----|------|-------|-----|
| Unmitigated Impact, dB Excess over Future "No Build" | 0-5 | 6-10 | 11-15 | >15 |
| | | | | |

Predicted Noise Impact - Without Mitigation - Mount Albion Road to King Street

Red Hill Creek Expressway IADP - Hamilton, Ont.

True North



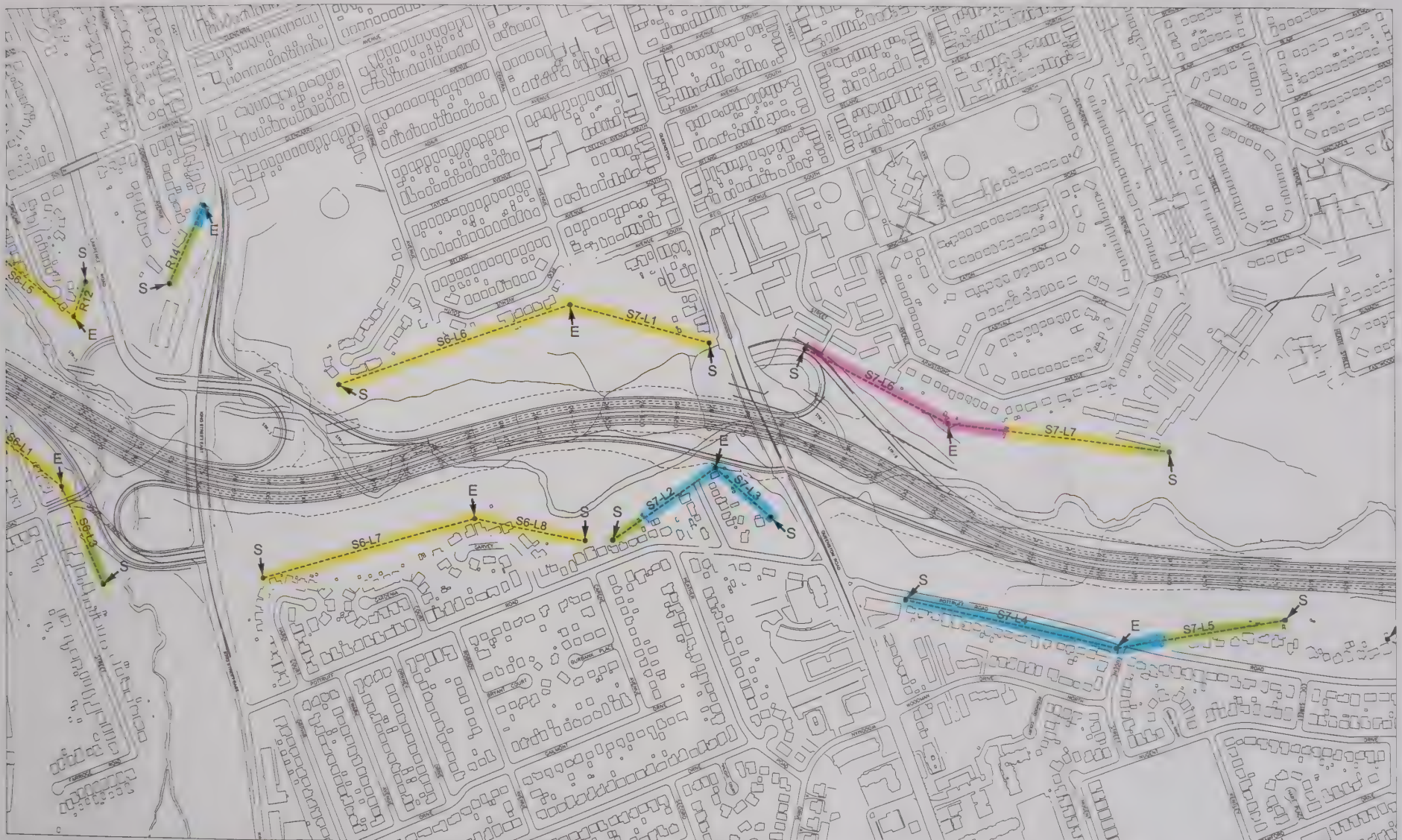
Drawn by: DJM Figure: 5.2

Approx. Scale: 1:5000

Job No. 97-207

Date Revised: May 20, 1998


RWDI



| | | |
|--|-------|------|
| Unmitigated Impact, dB Excess over Future "No Build" | 0-5 | 6-10 |
| | 11-15 | >15 |

Predicted Noise Impact - Without Mitigation - King Street to Barton Street

Red Hill Creek Expressway IADP - Hamilton, Ont.

True North

 Drawn by: DJM Figure: 5.3
 Approx. Scale: 1:5000
 Date Revised: May 20, 1998





| | | | | |
|--|-----|------|-------|-----|
| Unmitigated Impact, dB Excess over Future "No Build" | 0-5 | 6-10 | 11-15 | >15 |
| | | | | |

Predicted Noise Impact - Without Mitigation - Barton Street to QEW

Red Hill Creek Expressway LADP - Hamilton, Ont.

True North



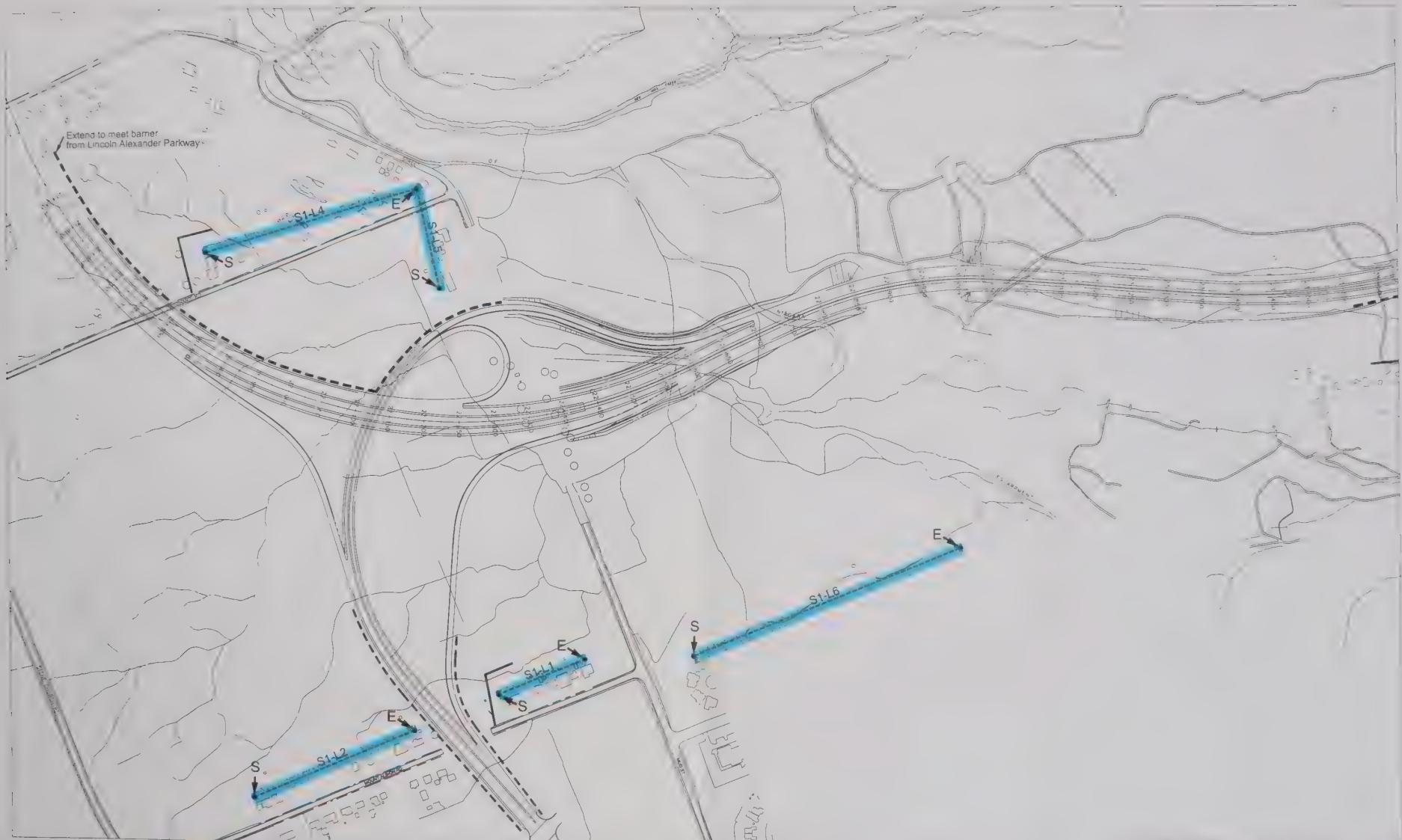
Drawn by: DJM Figure: 5.4

Approx. Scale: 1:5000

Job No. 97-207

Date Revised: May 20, 1998

RWDI



Mitigated Impact,
dB Excess over
Future "No Build"

0-5 6-10 11-15 >15

Highway Row Barrier
Property Line Barrier

Predicted Noise Impact - with Mitigation - Pritchard Road to Mount Albion Road

Red Hill Creek Expressway IADP - Hamilton, Ont.

True North



Drawn by DJM Figure 5.5

Approx Scale 1:5000

Job No. 97-207

Date Revised: May 20, 1998

RWDI



Mitigated Impact,
dB Excess over
Future "No Build"

0-5 6-10
11-15 >15

Highway Row Barrier
Property Line Barrier

Predicted Noise Impact - with Mitigation - Mount Albion Road to King Street

Red Hill Creek Expressway IADP - Hamilton, Ont.

True North
N

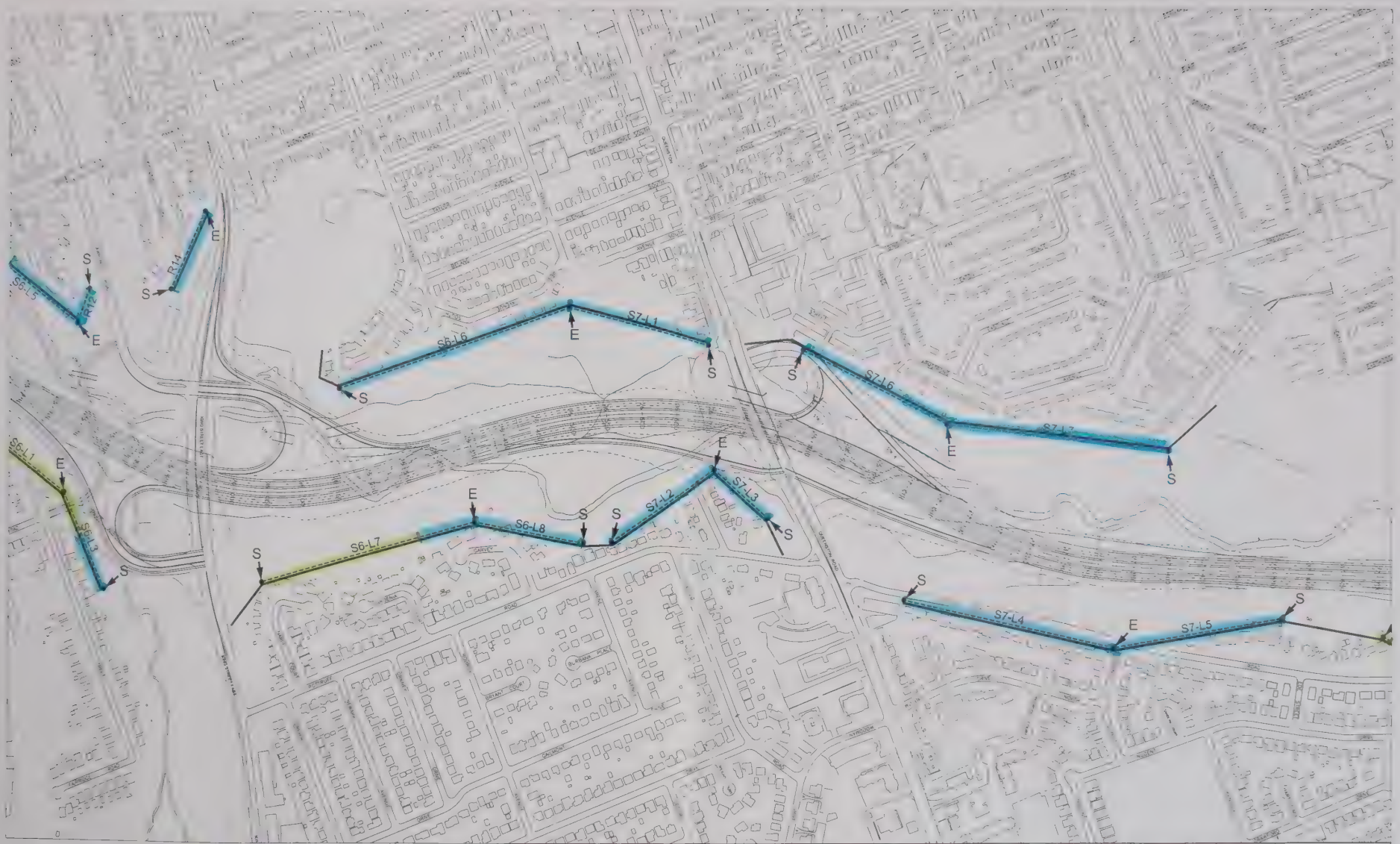
Drawn by DJM Figure 5.6

Approx. Scale: 1:5000

Job No. 97-207

Date Revised: May 20, 1998

RWDI



Mitigated Impact,
dB Excess over
Future "No Build"

0-5 6-10
11-15 >15

Highway Row Barrier
Property Line Barrier

Predicted Noise Impact - with Mitigation - King Street to Barton Street

Red Hill Creek Expressway IADP - Hamilton, Ont.

True North



Drawn by DJM Figure 5.7

Approx Scale 1:5000

Job No 97-207

Date Revised May 20, 1998

RWDI



Mitigated Impact,
dB Excess over
Future "No Build"

| | | | |
|-------|--|------|--|
| 0-5 | | 6-10 | |
| 11-15 | | >15 | |

Highway Row Barrier

Property Line Barrier

Predicted Noise Impact - with Mitigation - Barton Street to QEW

Red Hill Creek Expressway IADP - Hamilton, Ont.

True North



Drawn by DJM Figure 5.8

Approx. Scale: 1:5000

Job No. 97-207

Date Revised: May 20, 1998

RWDI

APPENDIX A

APPENDIX A

ENVIRONMENTAL NOISE DESCRIPTORS AND TERMINOLOGY

Ambient or Background Noise: The ambient noise from all sources other than the sound of interest (i.e. sound other than that being measured). Under most MOEE guidelines aircraft overflights and train noise due to their transient nature are normally excluded from measurements of background noise.

dB - Decibel: A logarithmic measure of sound pressure level. See sound pressure level.

dBA - Decibel, A-Weighted: A logarithmic measure of sound pressure level, using a frequency weighting that mimics the response of the human ear. The resultant sound pressure level is therefore representative of the subjective response of the human ear. A-weighted sound pressure levels are denoted by the suffix 'A' (ie. dBA).

Energy Equivalent Sound Level (L_{eq}): An energy-average sound level taken over a specified period of time. It represents the average sound level encountered for the period. The time period is often added as a suffix to the label (ie. L_{eq} (24) for the 24 hour equivalent sound level). L_{eq} is usually in dBA. An L_{eq} value expressed in dBA is a good single number descriptor of the annoyance of noise.

Human Perception of Sound: The human perception of noise impact is an important consideration in the quantification of the noise effects caused by projects. The following table is a rough guideline.

| Increase in Noise Level (dBA) | Perception |
|-------------------------------|------------------------|
| 3 | barely perceptible |
| 5 | definitely perceptible |
| 10 | twice as loud |

Ninetieth Percentile Noise (L_{90}): The noise level exceeded 90% of the time. It is a statistical measure of the noise level excluding short term peak noises, such as occasional traffic or a barking dog.

Noise: Unwanted sound.

Sound Pressure Level (SPL): The logarithmic ratio of the instantaneous sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is described by equation (1) where P is the pressure due to a sound and P_0 is the reference pressure. P_0 is usually taken as 2.0×10^{-5} Pascals.

$$(1) \quad \text{SPL (dB)} = 20 \text{ LOG } (P/P_0)$$

Discussion of Noise Metrics

Ambient data is usually measured using hourly values of L_{eq} , L_{10} , L_{50} , and L_{90} . In an urban environment, a nighttime “dip” in sound levels is typically observed (see Figure 4.2.1). The nighttime dip is usually only present for a few hours centred about 0300 to 0400 hours. Past 0500, sound levels rise as morning rush hour begins. Two peaks during the day, centred on the morning and evening rush hours may also be observed. However, this typical pattern may not be seen at all locations in an urban environment.

The L_{eq} is defined as the energy equivalent sound exposure averaged over a given time period. An L_{eq} value is therefore the constant sound level that would have the same energy as the actually observed varying sound levels throughout the time period being averaged. In many cases, the L_{eq} descriptor is the measure most highly correlated with community response to noise. Common time periods are one hour, 24 hours, 16 hours (daytime), and 8 hours (nighttime). L_{eq} values are sensitive to high level transient sound events.

The L_{90} measure is the sound level exceeded 90% of the time, and as such, it is a good measure of the background sound environment, since short term events such as traffic and train pass-bys are excluded. For a location near a busy thoroughfare, the L_{90} is a good approximation of the sound level that would be experienced during lulls in traffic, and typify the sound exposure levels of the “urban hum”. Similarly, L_{50} is the sound level exceeded 50% of the time, and provides an estimation of the average sound environment.

L_{10} values, the sound level exceeded 10% of the time, when examined in relation to the L_{eq} , can indicate the nature of the sound environment. L_{10} values are usually higher than L_{eq} , but both metrics usually track closely. Where L_{eq} values exceed L_{10} , high sound level events, such as train pass-bys, are indicated.

APPENDIX B



Ministry
of
Transportation

MAR 04 1992

MINISTRY DIRECTIVE

Program: Quality & Standards

Directive: A-1

Issuing Authority: Deputy Minister

Date of Issue: 78 07 10

Effective Date: 92 03 01

Revised Date: 92 02 21

TO: Assistant Deputy Ministers, Executive Directors, Regional Directors, Directors, District Engineers,
Regional Managers, Office Managers

SUBJECT: Noise Policy and Acoustic Standards for Provincial Highways

ALTERNATIVE INDEX LISTING(S):

Noise Barrier Policy
Provincial Highways Noise Policy
Residential Noise Policy
Acoustic Policy

003292 100256 ----
MTO ENVIRONMENTAL OFFICE
MANAGER
2ND FLOOR, WEST BUILDING
DOWNSVIEW, ONTARIO
M3M 1J8

REFERENCE:

This directive cancels and supersedes Provincial Highways Directive A-1 (87 08 24)

Provincial Highways Directive B-94, "Noise Assessment and Abatement Program - Ministry Responsibilities" (90 01 31)

Provincial Roads Directive B-116

"(a) Noise Barrier Technical Committee (NBTC)

(b) Noise Barrier Design Liaison Committee (NBDLC)" (81 05 08)

Municipal Transportation Roads Directive B-11, "Subsidy of Noise Control Measures on Municipal Roads" (88 06 30)

Provincial Highways Directive B-55, "Highway Improvements Associated with Land Development" (83 08 26)

Provincial Roads Directive B-61, "Cost Effective Analysis of Environmental Protective Measures" (79 11 20)

Environmental Assessment Act, R.S.O. 1990

Environmental Protection Act, R.S.O. 1990

A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments. February, 1986

Guidelines on noise and new residential development adjacent to freeways, Ministry of Housing, April, 1979

Contract Design Estimating and Documentation Manual

Environmental Office Manual, Technical Areas - Noise

Environmental Office, Environmental Assessment Policy Section

PURPOSE:

To document Ministry policy for investigation and controlling of Provincial Highway noise and its effect on adjacent noise sensitive areas.

To update warrants for noise control measures.

BACKGROUND:

Legislation

The Environmental Protection Act, R.S.O. 1990 is binding on the Crown. Subsection 1.(c) defines sound as a contaminant. Section 13 prohibits the emission of a contaminant into the natural environment that may have adverse environmental effects and, as such, imposes some obligations on MTO to limit the emission of noise from highways.

The Environmental Assessment Act, R.S.O. 1990 (Amended 1989), requires the Ministry to predict possible environmental impacts resulting from an undertaking, and to define the actions necessary to mitigate these. These include impacts and mitigation from construction and highway traffic generated noise.

Government Policy

On February 8, 1977, the Ministries of Housing (now Ministry of Municipal Affairs) and Transportation and Communications (now Ministry of Transportation) jointly released a policy statement regarding noise associated with major freeways. On May 29, 1979, the Ministry of Housing released a supplementary guideline for noise on behalf of the Government.

In addition, in February 1986, the Ministries of Environment and Transportation (and Communications) signed "A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments". This Protocol applies to the MTO Capital Construction Program for all classes of MTO Provincial Highways, both urban and rural.

It is the policy of the Government to address highway noise when planning, designing and constructing highways. Where the noise level generated by use of a highway exceeds acceptable standards for adjacent noise sensitive areas, MTO will consider improvements designed to attenuate the noise. Similarly, to avoid future noise problems, developers must design new residential areas in an acoustically sensitive manner in accordance with the guidelines issued by the Ministries of Municipal Affairs and

Environment and in consultation with the affected municipality.

In keeping with Government policy, MTO developed a Retrofit Noise Barrier Program to alleviate noise impacts on existing noise sensitive areas adjacent to existing freeways.

POLICY:

This directive and the appendices attached hereto describe policy which must be adhered to for identifying noise sensitive land uses, predicting noise levels, determining impacts and providing for mitigation in a variety of different situations.

For ease of reference, the directive has been separated into a number of Appendices as follows:

- Appendix One - Definitions
- Appendix Two - Construction Noise Process
- Appendix Three - Highway Construction Projects (Excluding Retrofit)
- Appendix Four - Retrofit of Existing Freeways
- Appendix Five - New Residential Development Adjacent to Freeways
- Appendix Six - New Residential Development Adjacent to Designated Freeways

IMPLEMENTATION: 92 03 01

-oOo-

Appendix One - Definitions

For ease in reading this appendix, text in italics is defined elsewhere in the definitions.

Acoustical Barriers

These include walls, berms and combinations of the two which are effective in reducing sound levels.

Adjacent

The term *adjacent* defines those *NSA's* lying near *Ministry highway* rights-of-way, although not necessarily contiguous to them. An intervening land use may be located between the source and *receiver*, if that land use is such that its zoning or official plan designation is anticipated to prevent a change in the future to a use which, in itself, will be a barrier to noise.

Aesthetics

Aesthetics is a recognition of the sensitivity of the interaction between the *highway* and the surrounding landscape.

Ambient/Existing Noise Level

This is the all-encompassing noise associated with a given environment, usually consisting of a composite of sounds from many sources. It is also the *noise level* prior to construction of an *undertaking*. Where a facility exists, *ambient* will include the noise presently emitting from it.

Candidate Site

This includes *NSA's* which meet the criteria for inclusion on the Candidate Sites for Noise Barrier Retrofit List. This does not necessarily mean that the site will satisfy all warrants for noise barrier construction.

Decibel Scale

A linear numbering scale used to define a logarithmic amplitude scale, thereby compressing a wide range of amplitude values to a small set of numbers. This system is used to compress sound pressure levels. The scale is often weighted using the "A" weighting frequency adjustments because it most closely approximates the frequency response of the average human ear.

Environmental Report

This includes all reports prepared in compliance with Environmental Assessment Act requirements and submitted to the Ministry of the Environment for acceptance, approval, informational or monitoring purposes and the public record. These include Environmental Assessment Reports, Environmental Study Reports, Environmental Status Statements, and Design and Construction Reports.

Appendix One

First Row Receiver

This term shall be defined as all those *adjacent* receivers where *noise level* differences are imperceptible (within 3 dBA) from the noisiest receiver.

Freeway

For this directive *freeway* is defined as an existing completed, partially developed (staged) or proposed divided *highway* with full control of access, grade separated intersections. It is recognized that this definition may include some *highways* that are not officially designated as *freeways*.

Highway

For this directive *highway* is defined as any road under the jurisdiction of the *Ministry*.

Ministry

For this directive *ministry* is defined as the Ministry of Transportation.

Mitigation Measure

These include walls, berms, adjustment to horizontal and vertical alignments and pavement types which are designed to result in reduced *noise levels* in *NSA's*.

Noise Level

- a) *Noise levels* are the 24 hour equivalent sound level (L_{eq} 24 hr) expressed on the A-weighted *decibel scale* (dBA).
- b) Noise predictions will be calculated using the United States Federal Highway Administration (FHWA) Noise Prediction Model. The following computerized models are accepted by the Environmental Office:
 - STAMINA 2.0,
 - Stamson (Versions 3.0 and 4.1 only),or other versions subsequently approved for use by the Environmental Office.
- c) When setting priorities for retrofit and determining impacts for *highways*, traffic volume shall be 1/24 of the higher of the Average Annual Daily Traffic (AADT) volume or Summer Average Daily Traffic (SADT) volume.
- d) Vehicle speeds used in the evaluation of impacts shall be the posted speed limits.
- e) Commercial vehicle percentage shall be those available from Regional Traffic Sections. Where unknown, the percentage for *freeways* can be assumed to be 20% (15% heavy trucks and 5% medium trucks). For all other classes of *highways*, the percentage is 13% (8% heavy trucks and 5% medium trucks).

Noise Level (continued)

- f) Receivers shall be located in the outdoor living area.

Noise Sensitive Areas (NSA) for Retrofit

- a) *NSA's* shall be interpreted to mean areas that are either:
- *Adjacent* to existing *freeways* and are existing residential areas where approvals were received under the Planning Act prior to February 8, 1977. Except as noted below, residential developments approved after the announcement in 1977 of the policy for noise and new residential developments adjacent to *freeways* do not qualify;
 - *Adjacent* to new *freeways* and are existing residential developments where approvals were received under the Planning Act prior to the designation of the proposed *freeway* route under the Public Transportation and Highway Improvement Act; or
 - *Adjacent* to expanding *freeways* and are existing residential developments where approvals were received under the Planning Act prior to the implementation of the *highway* expansions and where noise control measures were not required at the time of *highway* construction.
- b) The majority of the residences in the area must be zoned as residential and taxed as principal residences to ensure that funds are directed to areas of greatest need (i.e. principal residences).
- c) There is no minimum number of residences that define a *NSA*. Therefore, all noise sensitive land uses, regardless of size or location (urban or rural), should be assessed for application of noise control measures.
- d) Discretion should be exercised for situations where there is a potential for the zoning to be changed from a noise sensitive land use to a non-sensitive land use.
- e) *NSA's* must have an *OLA* associated with the residential unit.
- f) The following land uses, with *OLA's* associated with them would qualify as *NSA's* under the above criteria:
- Private homes such as single family residences;
 - Townhouses;
 - Multiple unit buildings, such as apartments with *OLA's* for use by all occupants; and
 - Hospitals, nursing homes for the aged, where there are *OLA's* for the patients.

Land uses listed below, by themselves do not qualify as *NSA's*:

- Apartment balconies above ground floor;
- Educational facilities (except dormitories with *OLA's*);
- Churches;
- Cemeteries;
- Parks and picnic areas which are not inherently part of a *NSA*;
- Day care centres;

Noise Sensitive Areas for Retrofit (Continued)

- All commercial;
- All industrial.

Noise Sensitive Areas For Highway Construction

The Environmental Assessment Act, where applicable, requires that noise impacts and potential mitigative measures be assessed. These areas shall be interpreted to mean all *NSA's* as defined for Retrofit (excluding the requirement that the *highway* be a *freeway*), as well as institutional and specific definitions of "residential areas" and "quiet areas" found in municipal noise control bylaws approved by the MOE under Section 138 of the Environmental Protection Act.

Outdoor Living Area (OLA)

The *OLA* is defined as an area at ground level, *adjacent* to a *NSA* and accommodating outdoor living activities. This area may be situated on any side of the *NSA*. The usual distance from the dwelling unit wall is 3 m. The vertical height is 1.2 metres above the existing ground surface. Where unknown, the side closest to the *highway* should be assumed. Paved areas for multiple dwelling residential units may not be defined as an *OLA*.

Retrofit Barrier Site

This includes barrier *candidate sites* which satisfy all warrants for construction and therefore qualify for inclusion on the capital construction program when priorities dictate and funds become available.

Undertaking

As defined by Subsection 1.(o)(i) of the Environmental Assessment Act:

"an enterprise or activity or a proposal, plan or program in respect of an enterprise or activity by or on behalf of Her Majesty in right of Ontario, by a public body or public bodies or by a municipality or municipalities, or".

Appendix Two - Construction Noise Process

1. General

The following policies apply to all highway projects.

2. Environmental Assessment Process

- a) NSA's shall be identified during the project planning stage.
- b) Potential noise impacts of construction equipment on NSA's shall be identified. These might include impacts resulting from hours or type of operation or proximity of equipment.
- c) Potential mitigation of noise impacts from construction equipment should be identified. These might include measures such as timing constraints, setbacks of certain operations from NSA's, or quieter equipment.
- d) In selecting the appropriate construction noise control measures, the Ministry will evaluate the technical and economic feasibility of the various alternatives.
- e) Municipal noise control bylaws shall be reviewed for requirements which may cause hardship to the Ministry or its contractor when implementing a project. This can be a particular problem when the need for night construction work is identified.
- f) In certain situations, a contract may require work that is in contravention of a municipal noise control bylaw. In these cases the Regional Environmental Unit will ensure that an exemption for the contractor is obtained from the municipality prior to construction. If the exemption is not obtained, the construction project may not proceed in a manner that is in contravention of the bylaw. Notwithstanding this requirement, it is always the contractors responsibility to be aware of bylaws and abide by them.

3. Environmental Assessment Documentation

- a) Where an environmental report is required, the following shall be documented:
 - NSA's
 - identification of municipal noise control bylaws
 - an explanation of any hardships to the Ministry caused by municipal noise control bylaws
 - construction noise complaint process. (See section 4)
- b) Environmental reports shall state that, where work is done by contract, enforcement of noise control bylaws is the responsibility of the municipality. Where work is done by day labour or equipment rental, the Ministry shall ensure its operations comply.

4. Contract Preparation

- a) General construction measures, setbacks from NSA's, timing constraints, or specific scheduling of construction activities including pre-construction of noise barriers, where required and where practical, will be included in the contract documents. The NSA's must be identified in the contract package using SP 199F33.
- b) When known prior to contract preparation, the details of any exemption from any municipal noise control bylaw will be outlined in the contract documents using SP 199F31.
- c) Special Provisions 199F31 and 199F33, which are to be placed in contract documents will be taken from the Contract Design Estimating and Documentation (CDED) Manual.

5. Construction Noise Complaint Process

- a) Any initial complaint from the public will require verification by the Ministry that all noise control measures to be applied are in effect. The Ministry will investigate any noise concerns, advise the contractor of any problems, and enforce its contract.
- b) Notwithstanding compliance with any noise control measures identified in the contract documents, a persistent complaint will require the Ministry to undertake a field investigation to determine noise level emissions. Where noise level emissions, for that construction equipment in use, exceed the sound level criteria for construction equipment contained in the MOE Model Municipal Noise Control Bylaw, the Ministry shall require the contractor to comply with the sound level criteria where quieter alternative equipment is reasonably available. When this occurs, the Ministry shall pay the contractor for costs incurred. Where a quieter alternative is not reasonably available, the equipment in use will be accepted.

NOTE: Neither the MOE Model Municipal Noise Control Bylaw nor noise emission levels are required in the contract package.

Appendix Three - Highway Construction Projects (Excluding Retrofit)

1. General

This policy is based on the "MOE/MTC Protocol for Dealing with Noise Concerns During the Preparation, Review, and Evaluation of Provincial Highways Environmental Assessments".

Where a highway construction project is proposed through or adjacent to an existing or draft approved residential area, the Ministry shall investigate the feasibility of attenuating noise where impacts are significant (> 5 dBA). The objective shall be to reduce noise levels, where warranted, to as close to 55 dBA or pre-construction ambient as is technically or economically feasible.

The following warrants and policies apply to projects which require Environmental Assessments (i.e. A and B projects).

2. Study Area

To determine the area of impact from road traffic noise, the smallest study area should be defined using one of the following methods:

- a) using 5 decibel contour lines extending from the source to a NSA where there is no increase above the ambient sound level, or;
- b) a NSA where there is no increase above the ambient sound level, or;
- c) a perpendicular distance of 600 m from the closest edge of pavement.

3. Impact Assessment

- a) Within the study area, noise impacts will be determined for outdoor living areas of identified NSA's.
- b) Wherever possible, existing and future ambient noise levels should be predicted. However, where noise levels cannot be predicted reliably, a suitable ambient noise level should be chosen for each project and where questionable supported by measurements. These assumptions must be verified with the MOE.
- c) Future noise levels from the proposed undertaking shall be based on traffic projections 10 years after completion of the undertaking. Where traffic projections 10 years after completion are not available, the best available data may be used.
- d) To determine impact, a comparison shall be made between the "do nothing" alternative 10 years in the future and noise levels with the undertaking at the same date. In both cases, future traffic volumes should be used. The significance of a noise impact will be calculated by comparing these two sound levels.

Impact Assessment (Continued)

- e) The significance of a noise impact will be qualified by using the objective of 55 dBA in addition to the change in noise level above the ambient sound level.
- f) Documentation in environmental assessment reports should include the following:
 - i) a description of the NSA's (usually identifying discrete receiver locations) including maps as appropriate;
 - ii) the name of the noise prediction model used;
 - iii) results of existing ambient and future noise level predictions at NSA's for each route alternative; and
 - iv) for comparison of alternatives and assessment of impacts, grouping of each NSA subject to increases of 0 to 5.0 dBA, 5.1 to 10.0 dBA, > 10.1 to 15.0 dBA, and > 15.1 dBA. Similar groupings documenting sound level reductions may be helpful. (i.e. -5.0 to -0.1 dBA)

4. Mitigation

- a) Where a new or expanding highway adjacent to a noise sensitive land use is predicted to result in a noise level increase of 5 dBA or less, 10 years after completion, there is no need as part of the environmental assessment to implement noise control measures as the impact is considered to be slight. However, if warranted, it may be considered for inclusion on the Candidate Sites for Noise Barrier Retrofit List.
- b) Where a new or expanding highway adjacent to a noise sensitive land use will result in a noise level increase of greater than 5 dBA, 10 years after completion, the Ministry shall investigate noise control measures within the highway right-of-way.
- c) Noise control measures, where applied will be designed to achieve levels as close to, or lower than, the objective level of 55 dBA or pre-construction ambient noise levels as is technically or economically feasible.
- d) Noise control measures where applied, should be cost effective and achieve a minimum attenuation of 5 dBA averaged over the first row receivers.
- e) Noise control measures, where applied, should be erected at the time of road construction or shortly thereafter.
- f) When designing noise control measures, input on aesthetic treatments should be sought from the Landscape Architecture Unit of the Maintenance Operations Office.
- g) Where construction or expansion of a highway is planned through an area designated as a noise sensitive land use on an approved Official Plan, but where no specific development proposals have received draft approval, non-structural noise controls

Appendix Three

ix

Mitigation (Continued)

should be sought, eg: control of vertical and horizontal alignment, to minimize noise impacts provided that significant increases in initial project costs or subsequent maintenance costs will not be incurred.

- h) Retrofit noise barriers should be constructed as part of another capital construction project only where there is a significant cost savings or where a serious construction problem is avoided and as guided by the candidate list.
- i) Documentation in environmental reports should include a discussion of mitigation measures including need, cost/effectiveness, applicability to the project and construction timing. The practicability of each measure should be evaluated by such factors as effectiveness and technical and economic feasibility.

APPENDIX C

APPENDIX C

EXISTING SOUND ENVIRONMENT
1997 OBSERVATIONS

Noise Study Field Notes

Site Number: 1

Location: 239 Upper Mt. Albion Rd. - rear yard

Measurement Start: April 2, 1997
17:00

Measurement Stop: April 4, 1997
14:00

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|----------------|
| | | | Speed (knots) | Direction | | | |
| Apr 02/97 | 21:00 | 11.4 | 15 | W | 45 | 102.31 | Mostly Sunny |
| Apr 03/97 | 06:00 | 11.9 | 30 | SW | 68 | 101.37 | Overcast, Rain |
| | 14:00 | 15.8 | 30 | W | 51 | 101.49 | Overcast |
| | 21:00 | 10.0 | 7 | SW | 71 | 101.33 | Cloudy |
| Apr 04/97 | 07:00 | 0.7 | 4 | SE | 83 | 101.88 | Clear |
| | 14:00 | 13.2 | 17 | SSW | 51 | 101.96 | Partly Cloudy |

* Taken from Hamilton Airport

Primary Noise Sources

- sounds of nature
- road traffic on Mt. Albion and Mud Street

Comments

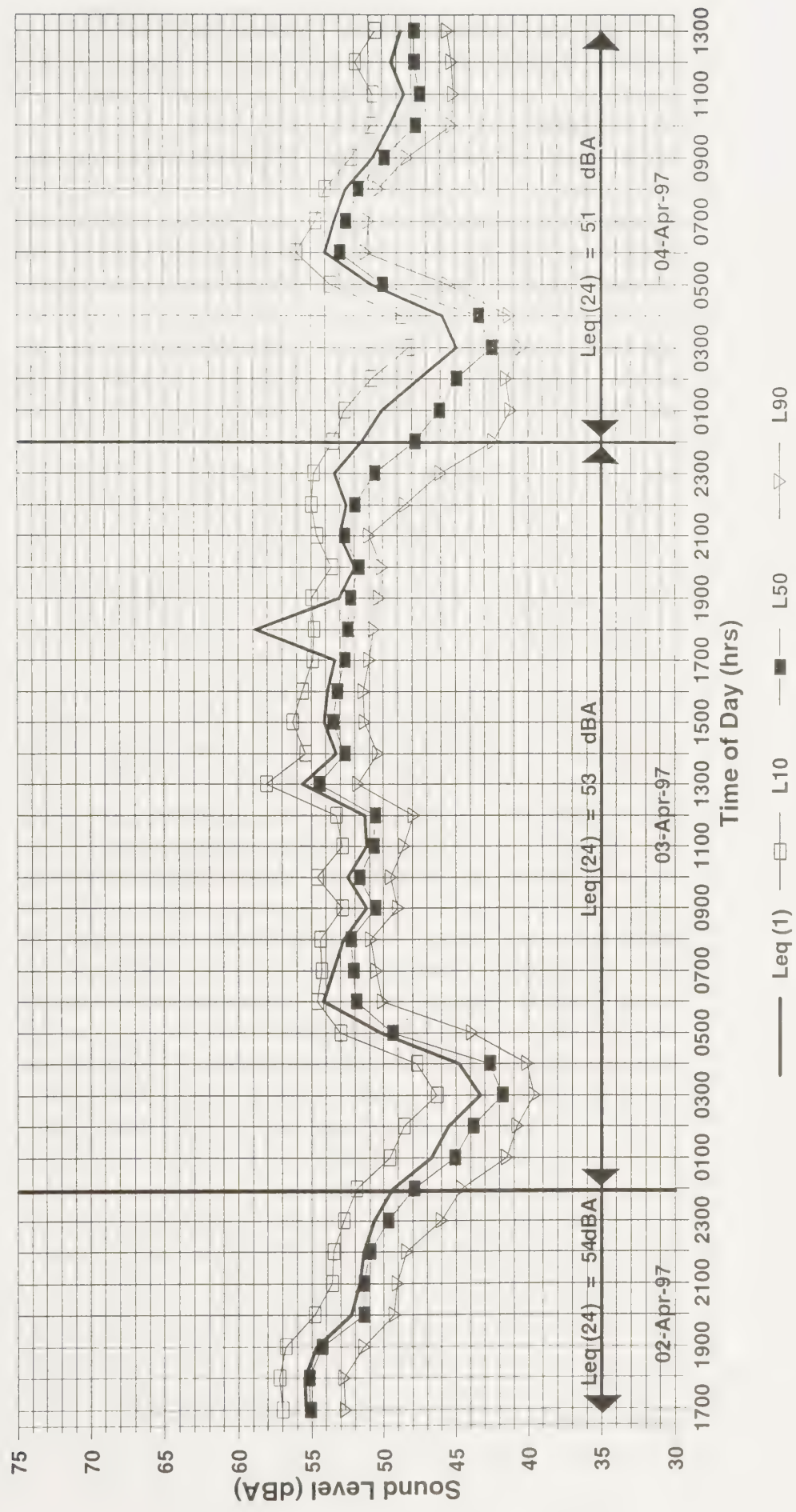
- area is residential
- undeveloped lands directly east

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 239 Upper Albion Road
Date: April 2 to April 4, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| 02-Apr-97 | 1600 | 58 | 49 | 74 | 69 | 65 | 60 | 55 | 53 | 50 |
| | 1700 | 55 | 49 | 68 | 60 | 58 | 57 | 55 | 53 | 50 |
| | 1800 | 56 | 49 | 63 | 60 | 58 | 57 | 55 | 53 | 51 |
| | 1900 | 55 | 47 | 64 | 60 | 58 | 57 | 54 | 51 | 49 |
| | 2000 | 52 | 47 | 59 | 57 | 56 | 55 | 51 | 49 | 48 |
| | 2100 | 52 | 47 | 60 | 56 | 54 | 54 | 51 | 49 | 47 |
| | 2200 | 51 | 46 | 60 | 56 | 54 | 54 | 51 | 48 | 47 |
| | 2300 | 51 | 42 | 69 | 57 | 54 | 53 | 50 | 46 | 43 |
| 03-Apr-97 | 0000 | 49 | 42 | 64 | 56 | 53 | 52 | 48 | 45 | 43 |
| | 0100 | 47 | 38 | 59 | 54 | 51 | 50 | 45 | 42 | 39 |
| | 0200 | 46 | 38 | 57 | 52 | 50 | 49 | 44 | 41 | 39 |
| | 0300 | 43 | 38 | 54 | 50 | 48 | 46 | 42 | 40 | 38 |
| | 0400 | 45 | 37 | 57 | 53 | 50 | 48 | 43 | 40 | 39 |
| | 0500 | 50 | 39 | 61 | 55 | 54 | 53 | 49 | 44 | 41 |
| | 0600 | 54 | 47 | 79 | 61 | 56 | 55 | 52 | 50 | 48 |
| | 0700 | 54 | 48 | 67 | 63 | 56 | 54 | 52 | 51 | 49 |
| | 0800 | 53 | 49 | 60 | 57 | 55 | 54 | 52 | 51 | 50 |
| | 0900 | 51 | 47 | 63 | 56 | 54 | 53 | 51 | 49 | 48 |
| | 1000 | 53 | 47 | 64 | 58 | 56 | 55 | 52 | 50 | 48 |
| | 1100 | 51 | 46 | 63 | 56 | 54 | 53 | 51 | 49 | 47 |
| | 1200 | 51 | 45 | 68 | 56 | 54 | 53 | 51 | 48 | 46 |
| | 1300 | 56 | 48 | 67 | 62 | 59 | 58 | 55 | 52 | 50 |
| | 1400 | 53 | 46 | 64 | 59 | 56 | 55 | 53 | 50 | 48 |
| | 1500 | 54 | 49 | 62 | 59 | 57 | 56 | 54 | 51 | 50 |
| | 1600 | 54 | 49 | 63 | 60 | 57 | 56 | 53 | 51 | 50 |
| | 1700 | 53 | 49 | 65 | 61 | 56 | 55 | 53 | 51 | 50 |
| | 1800 | 59 | 49 | 82 | 68 | 56 | 55 | 53 | 51 | 49 |
| | 1900 | 53 | 48 | 65 | 60 | 56 | 55 | 52 | 50 | 49 |
| | 2000 | 52 | 48 | 58 | 56 | 54 | 54 | 52 | 50 | 49 |
| | 2100 | 53 | 48 | 59 | 57 | 55 | 55 | 53 | 51 | 49 |
| | 2200 | 53 | 44 | 60 | 58 | 56 | 55 | 52 | 49 | 46 |
| | 2300 | 53 | 42 | 72 | 64 | 56 | 55 | 51 | 46 | 43 |
| 04-Apr-97 | 0000 | 52 | 40 | 70 | 63 | 57 | 54 | 48 | 42 | 41 |
| | 0100 | 50 | 38 | 70 | 60 | 55 | 53 | 46 | 41 | 39 |
| | 0200 | 48 | 38 | 64 | 56 | 53 | 51 | 45 | 42 | 40 |
| | 0300 | 45 | 39 | 56 | 53 | 50 | 48 | 43 | 41 | 40 |
| | 0400 | 46 | 39 | 59 | 55 | 51 | 49 | 43 | 41 | 40 |
| | 0500 | 51 | 41 | 60 | 57 | 55 | 54 | 50 | 46 | 42 |
| | 0600 | 54 | 48 | 66 | 60 | 57 | 56 | 53 | 51 | 49 |
| | 0700 | 53 | 49 | 64 | 61 | 56 | 55 | 53 | 51 | 50 |
| | 0800 | 53 | 47 | 72 | 58 | 55 | 54 | 52 | 50 | 49 |
| | 0900 | 51 | 45 | 65 | 56 | 53 | 52 | 50 | 48 | 47 |
| | 1000 | 50 | 42 | 69 | 58 | 52 | 51 | 48 | 45 | 43 |
| | 1100 | 49 | 42 | 64 | 55 | 52 | 51 | 47 | 45 | 43 |
| | 1200 | 49 | 42 | 62 | 58 | 54 | 52 | 48 | 45 | 43 |
| | 1300 | 49 | 42 | 62 | 56 | 51 | 51 | 48 | 45 | 44 |
| | 1400 | 49 | 42 | 69 | 55 | 51 | 50 | 47 | 45 | 44 |

Measurement Site 1
295 Upper Mt. Albion Rd. - RWDI, 1997



Noise Study Field Notes

Site Number: 2

Location: 10 Tamwood Cres., rear yard

Measurement Start: July 30, 1997
17:05

Measurement Stop: August 1, 1997
08:00

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-----------|
| | | | Speed (km/hr) | Direction | | | |
| Jul 30/97 | 21:00 | 21 | 7 | SW | 70 | 102.44 | Scattered |
| Jul 31/97 | 06:00 | 13 | 9 | W | 95 | 102.57 | Scattered |
| | 14:00 | 28 | 15 | N | 40 | 102.58 | Scattered |
| | 21:00 | 22 | 11 | NW | 50 | 102.39 | Scattered |
| Aug 1/97 | 06:00 | 16 | 11 | W | 85 | 102.24 | Overcast |

* Taken from Hamilton Airport

Primary Noise Sources

- nature sounds
- buzzing from air conditioning unit
- children playing in pool next door

Comments

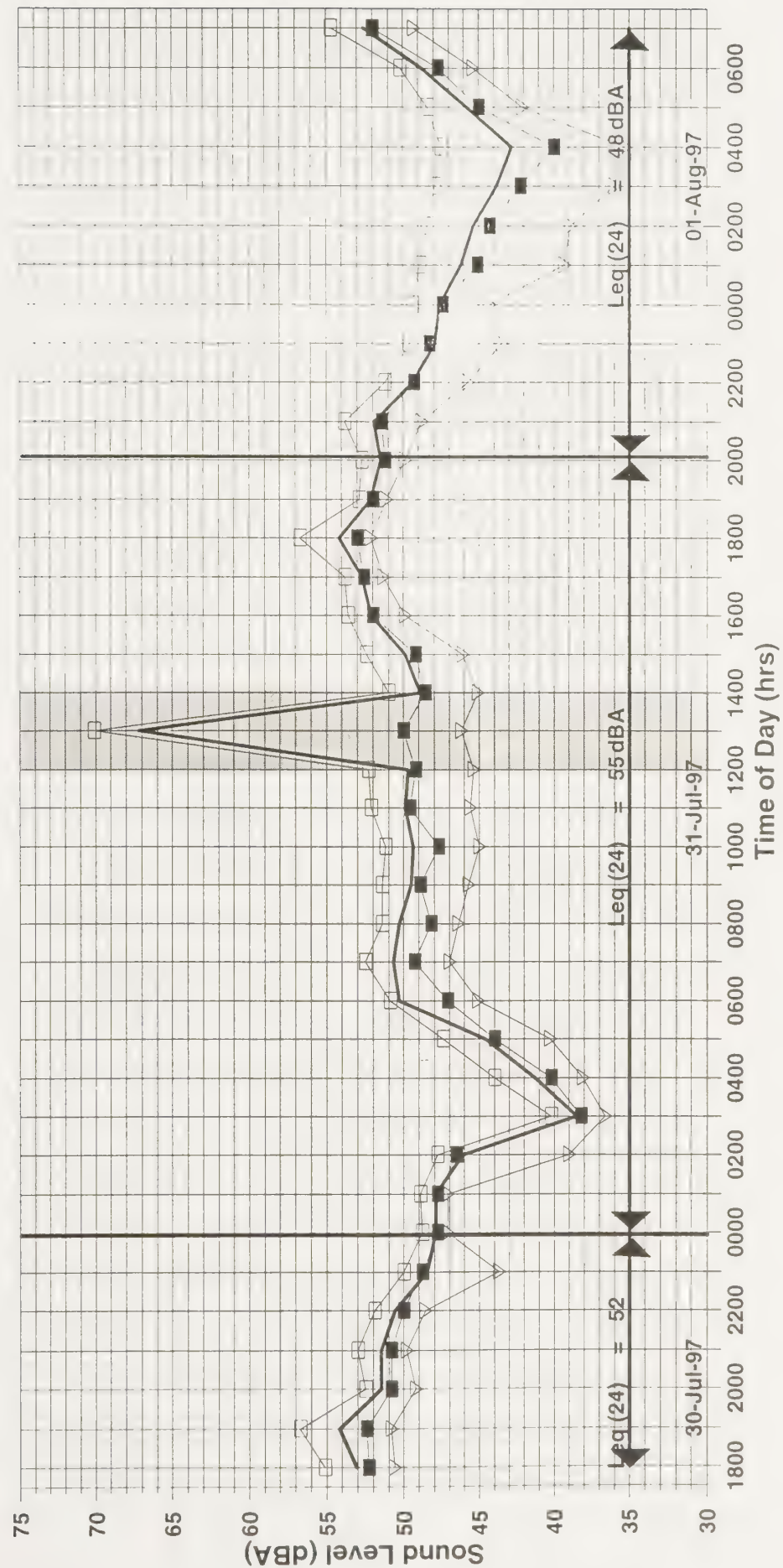
- area residential
- undeveloped lands directly west

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 10 Tamwood Cr.
Date: June 30 to August 1, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| 30-Jul-97 | 1800 | 53 | 60 | 49 | 59 | 57 | 55 | 52 | 51 | 49 |
| | 1900 | 54 | 74 | 50 | 61 | 58 | 57 | 52 | 51 | 50 |
| | 2000 | 52 | 68 | 46 | 58 | 53 | 53 | 51 | 49 | 47 |
| | 2100 | 52 | 67 | 49 | 57 | 54 | 53 | 51 | 50 | 49 |
| | 2200 | 51 | 62 | 48 | 57 | 53 | 52 | 50 | 49 | 48 |
| | 2300 | 49 | 54 | 40 | 51 | 51 | 50 | 49 | 44 | 42 |
| 31-Jul-97 | 0000 | 48 | 57 | 47 | 50 | 49 | 49 | 48 | 47 | 47 |
| | 0100 | 48 | 55 | 47 | 51 | 49 | 49 | 48 | 47 | 47 |
| | 0200 | 46 | 51 | 35 | 49 | 48 | 48 | 47 | 39 | 37 |
| | 0300 | 39 | 44 | 35 | 42 | 41 | 40 | 38 | 37 | 36 |
| | 0400 | 41 | 48 | 36 | 47 | 45 | 44 | 40 | 38 | 37 |
| | 0500 | 45 | 53 | 37 | 50 | 48 | 47 | 44 | 40 | 38 |
| | 0600 | 50 | 68 | 43 | 62 | 56 | 51 | 47 | 45 | 44 |
| | 0700 | 51 | 65 | 45 | 60 | 54 | 53 | 49 | 47 | 46 |
| | 0800 | 50 | 71 | 45 | 57 | 53 | 51 | 48 | 46 | 45 |
| | 0900 | 50 | 62 | 43 | 56 | 53 | 51 | 49 | 46 | 44 |
| | 1000 | 49 | 71 | 43 | 56 | 52 | 51 | 48 | 45 | 43 |
| | 1100 | 50 | 59 | 43 | 55 | 53 | 52 | 50 | 46 | 43 |
| | 1200 | 50 | 57 | 44 | 55 | 53 | 52 | 49 | 45 | 44 |
| | 1300 | 67 | 88 | 42 | 80 | 74 | 70 | 50 | 46 | 44 |
| | 1400 | 49 | 61 | 42 | 54 | 52 | 51 | 49 | 45 | 43 |
| | 1500 | 50 | 59 | 42 | 54 | 53 | 52 | 49 | 46 | 44 |
| | 1600 | 52 | 58 | 46 | 56 | 54 | 54 | 52 | 50 | 47 |
| | 1700 | 53 | 67 | 50 | 55 | 54 | 54 | 53 | 51 | 50 |
| | 1800 | 54 | 63 | 51 | 60 | 58 | 57 | 53 | 52 | 51 |
| | 1900 | 52 | 61 | 50 | 56 | 53 | 53 | 52 | 51 | 50 |
| | 2000 | 52 | 63 | 49 | 56 | 53 | 53 | 51 | 50 | 49 |
| | 2100 | 52 | 65 | 45 | 57 | 55 | 54 | 51 | 49 | 46 |
| | 2200 | 49 | 58 | 41 | 54 | 52 | 51 | 49 | 46 | 44 |
| | 2300 | 48 | 55 | 41 | 51 | 50 | 50 | 48 | 44 | 42 |
| 01-Aug-97 | 0000 | 48 | 58 | 41 | 52 | 50 | 49 | 47 | 44 | 43 |
| | 0100 | 46 | 51 | 35 | 50 | 49 | 49 | 45 | 39 | 37 |
| | 0200 | 45 | 52 | 34 | 50 | 49 | 48 | 44 | 39 | 35 |
| | 0300 | 44 | 51 | 32 | 49 | 48 | 48 | 42 | 36 | 33 |
| | 0400 | 43 | 55 | 32 | 49 | 48 | 48 | 40 | 35 | 33 |
| | 0500 | 46 | 55 | 35 | 51 | 49 | 48 | 45 | 42 | 37 |
| | 0600 | 49 | 65 | 43 | 56 | 52 | 50 | 48 | 45 | 44 |
| | 0700 | 53 | 61 | 46 | 57 | 56 | 55 | 52 | 49 | 47 |

Measurement Site 2
10 Tamwood Cr. - RWDI, 1997



Notes:
- Shaded area shows high level transient event during these hours which would not reflect the normal ambient.

Noise Study Field Notes

Site Number: 3

Location: 74 Brookstream Crt., rear yard

Measurement Start: August 1, 1997
13:30

Measurement Stop: August 6, 1997
08:30

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-----------|
| | | | Speed (km/hr) | Direction | | | |
| Aug 1/97 | 14:00 | 25 | 19 | W | 50 | 102.07 | Broken |
| | 21:00 | 21 | 11 | SW | 75 | 101.75 | Broken |
| Aug 2/97 | 06:00 | 20 | 13 | SW | 65 | 101.41 | Scattered |
| | 14:00 | 27 | 28 | W | 50 | 101.40 | Broken |
| | 21:00 | 24 | 15 | SW | 80 | 101.28 | Scattered |
| Aug 3/97 | 06:00 | 18 | 15 | NW | 90 | 101.43 | Scattered |
| | 14:00 | 25 | 13 | NW | 55 | 101.59 | Cloudy |
| | 21:00 | 22 | 9 | N | 50 | 101.45 | Overcast |
| Aug 4/97 | 06:00 | 15 | Calm | - | 85 | 101.32 | Scattered |
| | 14:00 | 23 | 17 | W | 70 | 101.28 | Cloudy |
| | 21:00 | 18 | 15 | N | 50 | 101.30 | Scattered |
| Aug 5/97 | 06:00 | 14 | 19 | N | 80 | 101.52 | Scattered |
| | 14:00 | 20 | 15 | NE | 50 | 101.72 | Broken |
| | 21:00 | 16 | 13 | NW | 50 | 101.80 | Scattered |
| Aug 6/97 | 06:00 | 8 | 6 | W | 90 | 101.99 | Broken |

* Taken from Hamilton Airport

Primary Noise Sources

- leaves rustling, birds (sounds of nature)
- buzzing from air conditioning units
- local traffic noise

Comments

- area is residential
- Red Hill Creek Valley directly west

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 74 Brookstream
Date: August 1 to 6, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| 01-Aug-97 | 1400 | 48 | 61 | 44 | 54 | 50 | 50 | 48 | 45 | 44 |
| | 1500 | 47 | 58 | 41 | 53 | 50 | 49 | 47 | 45 | 43 |
| | 1600 | 49 | 71 | 41 | 55 | 50 | 49 | 47 | 44 | 42 |
| | 1700 | 47 | 63 | 43 | 52 | 50 | 49 | 47 | 45 | 43 |
| | 1800 | 47 | 56 | 43 | 50 | 49 | 48 | 46 | 45 | 44 |
| | 1900 | 47 | 58 | 40 | 52 | 49 | 48 | 46 | 43 | 41 |
| | 2000 | 44 | 59 | 39 | 50 | 47 | 47 | 43 | 41 | 40 |
| | 2100 | 45 | 54 | 41 | 50 | 47 | 47 | 44 | 42 | 41 |
| | 2200 | 45 | 62 | 41 | 52 | 47 | 47 | 44 | 43 | 42 |
| | 2300 | 44 | 55 | 39 | 48 | 46 | 46 | 44 | 41 | 40 |
| 02-Aug-97 | 0000 | 42 | 54 | 38 | 48 | 45 | 44 | 41 | 40 | 38 |
| | 0100 | 42 | 54 | 38 | 50 | 46 | 44 | 41 | 40 | 39 |
| | 0200 | 44 | 57 | 40 | 51 | 46 | 45 | 43 | 41 | 40 |
| | 0300 | 44 | 59 | 40 | 52 | 45 | 45 | 43 | 42 | 41 |
| | 0400 | 44 | 59 | 41 | 48 | 46 | 46 | 44 | 43 | 42 |
| | 0500 | 45 | 54 | 41 | 52 | 48 | 47 | 45 | 43 | 41 |
| | 0600 | 44 | 55 | 41 | 49 | 47 | 46 | 44 | 43 | 42 |
| | 0700 | 49 | 64 | 41 | 61 | 53 | 50 | 45 | 44 | 42 |
| | 0800 | 45 | 54 | 40 | 51 | 47 | 46 | 44 | 42 | 40 |
| | 0900 | 42 | 59 | 38 | 49 | 45 | 44 | 41 | 39 | 38 |
| | 1000 | 43 | 60 | 38 | 51 | 45 | 44 | 41 | 39 | 38 |
| | 1100 | 44 | 61 | 38 | 51 | 47 | 46 | 42 | 40 | 39 |
| | 1200 | 46 | 61 | 39 | 55 | 50 | 49 | 44 | 41 | 40 |
| | 1300 | 47 | 65 | 39 | 55 | 50 | 48 | 45 | 42 | 40 |
| | 1400 | 48 | 61 | 44 | 54 | 51 | 50 | 47 | 46 | 44 |
| | 1500 | 48 | 57 | 46 | 52 | 50 | 49 | 48 | 47 | 46 |
| | 1600 | 50 | 65 | 46 | 59 | 54 | 51 | 48 | 47 | 46 |
| | 1700 | 50 | 63 | 47 | 56 | 53 | 52 | 49 | 48 | 47 |
| | 1800 | 49 | 62 | 47 | 53 | 51 | 50 | 49 | 48 | 47 |
| | 1900 | 48 | 52 | 46 | 50 | 49 | 49 | 48 | 47 | 46 |
| | 2000 | 48 | 53 | 46 | 51 | 49 | 49 | 48 | 47 | 46 |
| | 2100 | 48 | 56 | 47 | 50 | 49 | 49 | 48 | 47 | 47 |
| | 2200 | 48 | 55 | 47 | 52 | 50 | 49 | 48 | 47 | 47 |
| | 2300 | 48 | 55 | 45 | 52 | 51 | 50 | 48 | 46 | 45 |
| 03-Aug-97 | 0000 | 45 | 52 | 43 | 49 | 48 | 47 | 45 | 43 | 43 |
| | 0100 | 47 | 59 | 44 | 55 | 50 | 49 | 47 | 45 | 44 |
| | 0200 | 45 | 54 | 41 | 50 | 48 | 47 | 45 | 43 | 42 |
| | 0300 | 46 | 58 | 40 | 55 | 51 | 48 | 45 | 42 | 41 |
| | 0400 | 44 | 59 | 38 | 49 | 47 | 47 | 44 | 41 | 39 |
| | 0500 | 47 | 62 | 40 | 56 | 49 | 47 | 45 | 43 | 41 |
| | 0600 | 46 | 56 | 42 | 48 | 48 | 47 | 46 | 44 | 43 |
| | 0700 | 46 | 64 | 40 | 57 | 48 | 46 | 44 | 42 | 40 |
| | 0800 | 43 | 57 | 36 | 48 | 46 | 45 | 43 | 38 | 36 |
| | 0900 | 46 | 54 | 34 | 48 | 47 | 47 | 46 | 43 | 36 |
| | 1000 | 46 | 65 | 34 | 55 | 48 | 47 | 46 | 37 | 35 |
| | 1100 | 46 | 62 | 44 | 54 | 48 | 47 | 45 | 44 | 44 |
| | 1200 | 47 | 61 | 44 | 54 | 49 | 48 | 46 | 45 | 44 |
| | 1300 | 46 | 57 | 44 | 51 | 48 | 47 | 46 | 45 | 44 |
| | 1400 | 46 | 61 | 44 | 52 | 48 | 47 | 45 | 44 | 44 |
| | 1500 | 46 | 58 | 44 | 51 | 48 | 47 | 45 | 44 | 44 |
| | 1600 | 49 | 69 | 44 | 61 | 51 | 48 | 46 | 45 | 44 |
| | 1700 | 47 | 59 | 45 | 51 | 48 | 47 | 46 | 45 | 45 |

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 74 Brookstream
Date: August 1 to 6, 1997

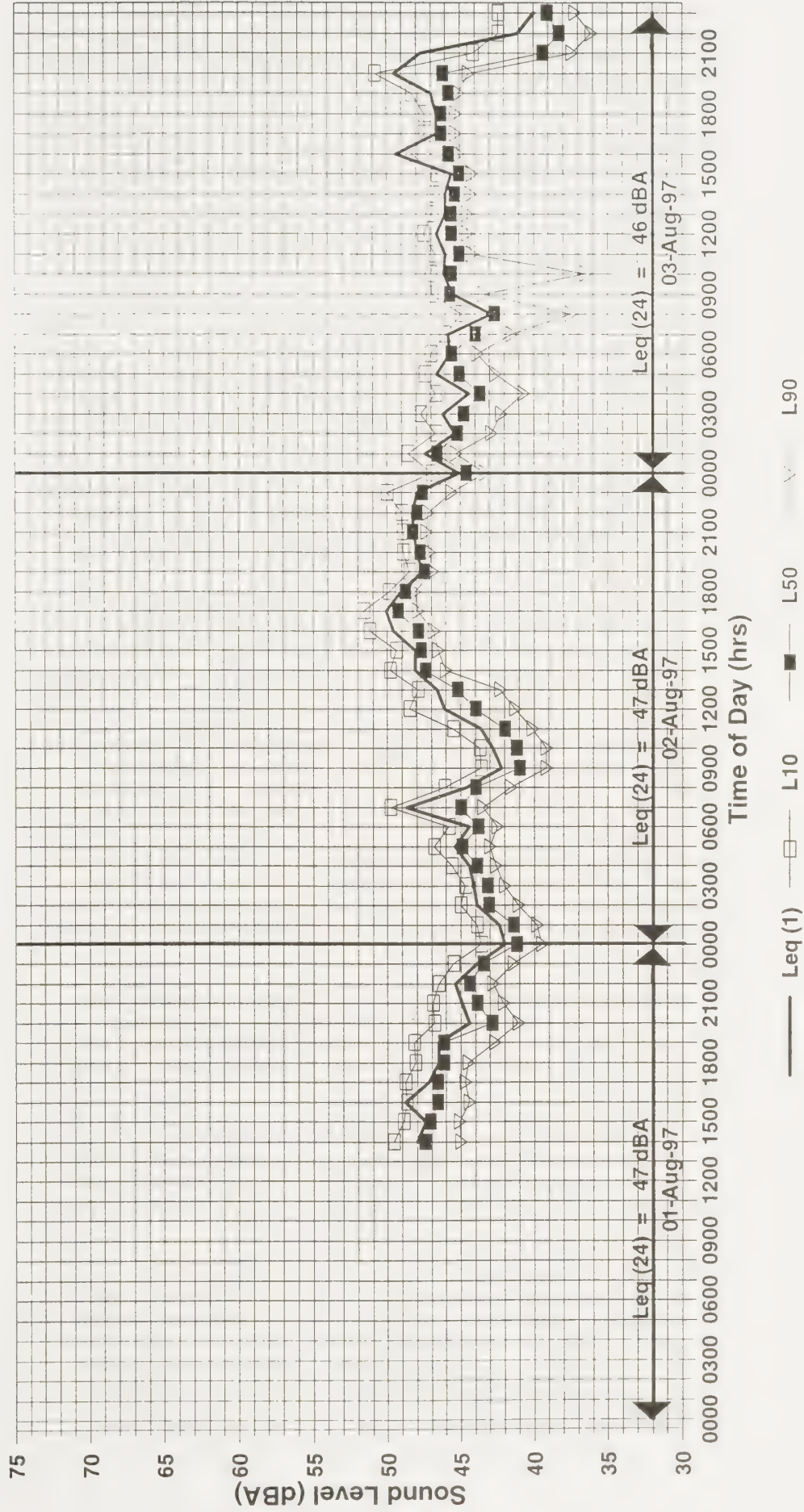
| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|------------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| | 1800 | 47 | 63 | 45 | 50 | 48 | 47 | 46 | 45 | 45 |
| | 1900 | 47 | 60 | 44 | 55 | 50 | 48 | 46 | 45 | 44 |
| | 2000 | 50 | 75 | 44 | 59 | 53 | 51 | 46 | 44 | 44 |
| | 2100 | 48 | 72 | 36 | 54 | 46 | 44 | 39 | 37 | 36 |
| | 2200 | 41 | 54 | 34 | 52 | 44 | 42 | 38 | 36 | 35 |
| | 2300 | 40 | 48 | 36 | 45 | 44 | 42 | 39 | 37 | 36 |
| 04-Aug-97, | 0000 | 46 | 55 | 36 | 51 | 50 | 49 | 45 | 39 | 36 |
| | 0100 | 44 | 51 | 35 | 51 | 49 | 48 | 41 | 36 | 35 |
| | 0200 | 41 | 51 | 37 | 45 | 44 | 44 | 40 | 39 | 37 |
| | 0300 | 41 | 58 | 33 | 54 | 41 | 40 | 37 | 35 | 34 |
| | 0400 | 36 | 46 | 32 | 41 | 39 | 38 | 36 | 34 | 32 |
| | 0500 | 40 | 49 | 33 | 45 | 44 | 43 | 40 | 35 | 33 |
| | 0600 | 42 | 60 | 35 | 52 | 45 | 44 | 40 | 37 | 35 |
| | 0700 | 44 | 52 | 38 | 50 | 49 | 48 | 43 | 40 | 39 |
| | 0800 | 39 | 61 | 33 | 46 | 43 | 41 | 37 | 35 | 34 |
| | 0900 | 45 | 66 | 42 | 53 | 49 | 47 | 43 | 42 | 42 |
| | 1000 | 48 | 75 | 43 | 56 | 53 | 51 | 45 | 43 | 43 |
| | 1100 | 48 | 62 | 42 | 57 | 54 | 51 | 44 | 43 | 42 |
| | 1200 | 54 | 79 | 42 | 55 | 49 | 46 | 44 | 42 | 42 |
| | 1300 | 61 | 79 | 42 | 75 | 68 | 59 | 44 | 43 | 42 |
| | 1400 | 61 | 84 | 43 | 73 | 68 | 64 | 49 | 44 | 43 |
| | 1500 | 62 | 80 | 34 | 74 | 70 | 64 | 45 | 40 | 35 |
| | 1600 | 59 | 77 | 34 | 73 | 65 | 60 | 44 | 36 | 34 |
| | 1700 | 44 | 58 | 33 | 53 | 48 | 46 | 42 | 35 | 34 |
| | 1800 | 47 | 76 | 35 | 54 | 49 | 48 | 44 | 38 | 37 |
| | 1900 | 62 | 82 | 39 | 76 | 69 | 64 | 45 | 41 | 40 |
| | 2000 | 53 | 85 | 38 | 64 | 56 | 52 | 44 | 41 | 39 |
| | 2100 | 44 | 59 | 39 | 51 | 47 | 46 | 42 | 40 | 39 |
| | 2200 | 45 | 60 | 41 | 52 | 49 | 47 | 44 | 42 | 41 |
| | 2300 | 45 | 53 | 41 | 49 | 47 | 46 | 44 | 43 | 42 |
| 05-Aug-97 | 0000 | 44 | 60 | 40 | 52 | 47 | 45 | 43 | 41 | 40 |
| | 0100 | 43 | 53 | 39 | 49 | 45 | 44 | 42 | 41 | 40 |
| | 0200 | 42 | 55 | 37 | 47 | 44 | 43 | 41 | 39 | 38 |
| | 0300 | 42 | 53 | 37 | 49 | 46 | 45 | 41 | 39 | 38 |
| | 0400 | 40 | 52 | 36 | 45 | 43 | 42 | 40 | 38 | 37 |
| | 0500 | 42 | 60 | 37 | 50 | 45 | 43 | 41 | 39 | 37 |
| | 0600 | 42 | 58 | 39 | 47 | 45 | 44 | 42 | 41 | 40 |
| | 0700 | 44 | 56 | 40 | 51 | 48 | 46 | 43 | 41 | 40 |
| | 0800 | 46 | 62 | 39 | 54 | 50 | 49 | 44 | 41 | 40 |
| | 0900 | 44 | 58 | 38 | 53 | 48 | 46 | 42 | 40 | 39 |
| | 1000 | 46 | 63 | 39 | 53 | 52 | 50 | 43 | 41 | 39 |
| | 1100 | 48 | 62 | 38 | 54 | 52 | 51 | 48 | 41 | 38 |
| | 1200 | 42 | 57 | 37 | 49 | 46 | 44 | 40 | 39 | 37 |
| | 1300 | 46 | 64 | 37 | 56 | 52 | 49 | 42 | 39 | 37 |
| | 1400 | 43 | 60 | 36 | 50 | 47 | 45 | 41 | 39 | 37 |
| | 1500 | 42 | 65 | 36 | 50 | 45 | 44 | 41 | 38 | 37 |
| | 1600 | 43 | 60 | 36 | 53 | 48 | 44 | 39 | 38 | 37 |
| | 1700 | 42 | 57 | 37 | 51 | 44 | 42 | 40 | 39 | 38 |
| | 1800 | 41 | 59 | 38 | 48 | 45 | 43 | 40 | 39 | 38 |
| | 1900 | 45 | 61 | 38 | 54 | 49 | 47 | 43 | 40 | 39 |
| | 2000 | 43 | 56 | 39 | 51 | 48 | 45 | 42 | 40 | 39 |
| | 2100 | 48 | 72 | 37 | 53 | 44 | 42 | 40 | 39 | 38 |

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

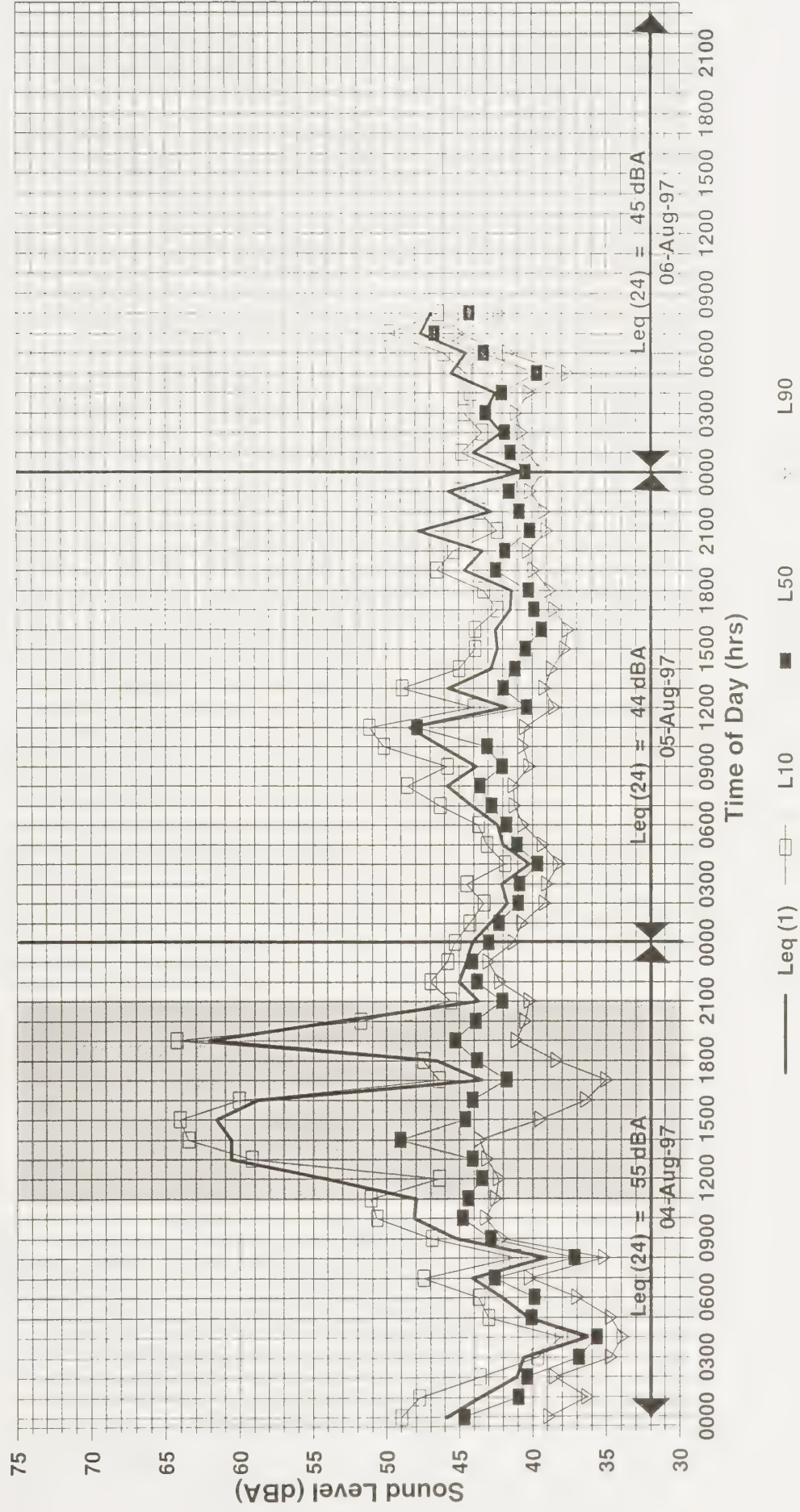
Site: 74 Brookstream
Date: August 1 to 6, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| | 2200 | 43 | 63 | 38 | 53 | 46 | 44 | 41 | 39 | 38 |
| | 2300 | 46 | 66 | 39 | 55 | 50 | 45 | 42 | 40 | 39 |
| 06-Aug-97 | 0000 | 41 | 57 | 38 | 44 | 43 | 42 | 41 | 39 | 39 |
| | 0100 | 44 | 57 | 39 | 54 | 50 | 45 | 42 | 40 | 39 |
| | 0200 | 42 | 48 | 39 | 45 | 44 | 43 | 42 | 41 | 40 |
| | 0300 | 43 | 49 | 39 | 46 | 45 | 45 | 43 | 41 | 40 |
| | 0400 | 43 | 52 | 38 | 47 | 45 | 44 | 42 | 40 | 39 |
| | 0500 | 46 | 63 | 36 | 58 | 52 | 45 | 40 | 38 | 36 |
| | 0600 | 45 | 56 | 40 | 53 | 48 | 46 | 43 | 42 | 40 |
| | 0700 | 48 | 59 | 43 | 52 | 51 | 50 | 47 | 45 | 44 |
| | 0800 | 47 | 70 | 41 | 56 | 47 | 46 | 44 | 42 | 41 |

Measurement Site 3
74 Brookstream - RWDI, 1997



Measurement Site 3 Continued 74 Brookstream - RWDI, 1997



Notes:

- Shaded area shows high level transient events (backyard party) during these hours which would not reflect the normal ambient.

Noise Study Field Notes

Site Number: 4

Location: 396 Queenston Rd. (Knowles Crt.), front yard

Measurement Start: August 6, 1997
12:50

Measurement Stop: August 8, 1997
12:15

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-----------|
| | | | Speed (km/hr) | Direction | | | |
| Aug 6/97 | 14:00 | 21 | 11 | N | 40 | 102.06 | Broken |
| | 21:00 | 18 | 11 | SW | 60 | 102.11 | Scattered |
| Aug 7/97 | 06:00 | 11 | 9 | SW | 90 | 102.30 | Clear |
| | 14:00 | 26 | 17 | NW | 50 | 102.29 | Scattered |
| | 21:00 | 21 | 11 | SW | 75 | 102.24 | Scattered |
| Aug 8/97 | 06:00 | 15 | 11 | SW | 100 | 102.32 | Fog |
| | 14:00 | 26 | 9 | SW | 40 | 102.27 | Scattered |

* Taken from Hamilton Airport

Primary Noise Sources

- leaves rustling
- traffic from Queenston Rd.
- birds

Comments

- area residential
- some commercial businesses nearby on Queenston Rd.
- Red Hill Creek Valley directly east

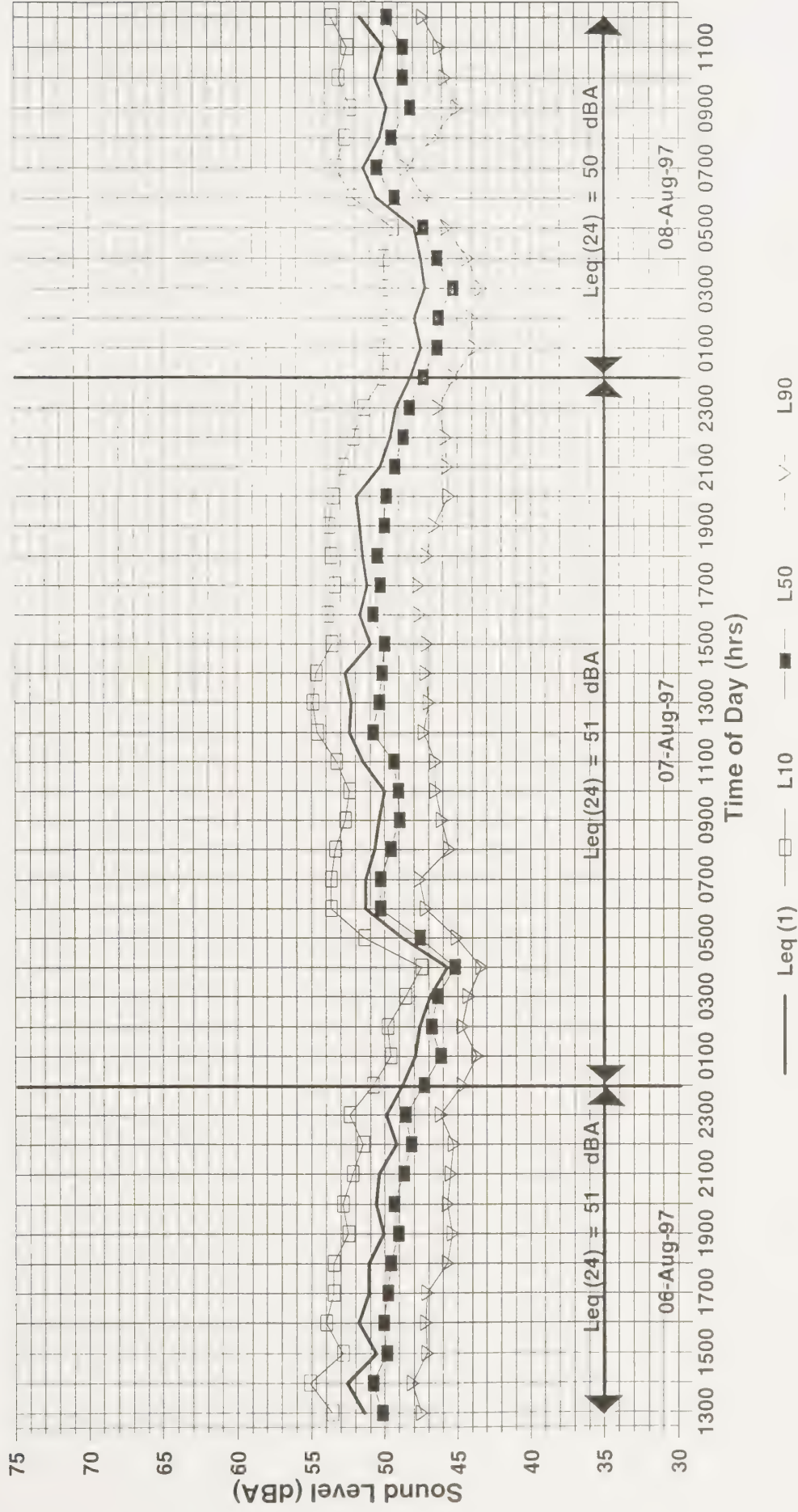
RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 396 Queenston Blvd.

Date: August 6 to 8, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|----------------|---------|------|------|----|----|-----|-----|-----|-----|
| 06-Aug-97 | 1300 | 51 | 69 | 44 | 58 | 55 | 54 | 50 | 48 | 45 |
| | 1400 | 53 | 66 | 43 | 61 | 57 | 55 | 51 | 48 | 46 |
| | 1500 | 51 | 65 | 44 | 56 | 54 | 53 | 50 | 47 | 45 |
| | 1600 | 52 | 68 | 44 | 60 | 56 | 54 | 50 | 47 | 45 |
| | 1700 | 51 | 65 | 43 | 58 | 55 | 54 | 50 | 47 | 45 |
| | 1800 | 51 | 68 | 40 | 59 | 55 | 54 | 50 | 46 | 43 |
| | 1900 | 50 | 66 | 42 | 57 | 54 | 53 | 49 | 45 | 44 |
| | 2000 | 51 | 68 | 43 | 58 | 54 | 53 | 49 | 46 | 44 |
| | 2100 | 50 | 73 | 44 | 57 | 53 | 52 | 49 | 46 | 44 |
| | 2200 | 49 | 64 | 43 | 56 | 53 | 52 | 48 | 45 | 44 |
| | 2300 | 50 | 64 | 44 | 57 | 54 | 52 | 49 | 46 | 45 |
| 07-Aug-97 | 0000 | 49 | 66 | 43 | 57 | 52 | 51 | 47 | 45 | 43 |
| | 0100 | 48 | 62 | 42 | 57 | 51 | 50 | 46 | 44 | 42 |
| | 0200 | 48 | 57 | 42 | 53 | 51 | 50 | 47 | 45 | 43 |
| | 0300 | 47 | 58 | 43 | 52 | 50 | 49 | 46 | 44 | 43 |
| | 0400 | 46 | 53 | 41 | 50 | 48 | 48 | 45 | 43 | 42 |
| | 0500 | 49 | 60 | 43 | 56 | 53 | 51 | 48 | 45 | 44 |
| | 0600 | 51 | 65 | 45 | 57 | 55 | 54 | 50 | 47 | 46 |
| | 0700 | 51 | 61 | 45 | 58 | 55 | 54 | 50 | 48 | 46 |
| | 0800 | 51 | 60 | 42 | 58 | 55 | 53 | 50 | 46 | 43 |
| | 0900 | 50 | 64 | 43 | 57 | 54 | 53 | 49 | 46 | 44 |
| | 1000 | 50 | 61 | 44 | 56 | 54 | 52 | 49 | 47 | 45 |
| | 1100 | 52 | 69 | 44 | 61 | 55 | 53 | 49 | 47 | 45 |
| | 1200 | 52 | 71 | 43 | 59 | 56 | 55 | 51 | 47 | 45 |
| | 1300 | 52 | 68 | 44 | 61 | 56 | 55 | 50 | 47 | 45 |
| | 1400 | 53 | 66 | 44 | 63 | 58 | 55 | 50 | 47 | 45 |
| | 1500 | 51 | 64 | 43 | 58 | 55 | 54 | 50 | 47 | 44 |
| | 1600 | 52 | 67 | 44 | 58 | 55 | 54 | 51 | 48 | 46 |
| | 1700 | 51 | 64 | 45 | 57 | 55 | 53 | 50 | 48 | 46 |
| | 1800 | 52 | 66 | 45 | 58 | 55 | 54 | 51 | 47 | 45 |
| | 1900 | 52 | 67 | 43 | 61 | 56 | 54 | 50 | 47 | 45 |
| | 2000 | 52 | 68 | 43 | 62 | 55 | 54 | 50 | 46 | 44 |
| | 2100 | 50 | 65 | 43 | 56 | 54 | 53 | 49 | 46 | 44 |
| | 2200 | 50 | 59 | 43 | 56 | 53 | 52 | 49 | 46 | 44 |
| | 2300 | 49 | 59 | 43 | 55 | 53 | 51 | 48 | 46 | 45 |
| 08-Aug-97 | 0000 | 48 | 63 | 43 | 55 | 51 | 50 | 47 | 45 | 44 |
| | 0100 | 48 | 57 | 42 | 54 | 51 | 50 | 46 | 44 | 43 |
| | 0200 | 48 | 67 | 43 | 55 | 51 | 50 | 46 | 44 | 43 |
| | 0300 | 47 | 59 | 42 | 55 | 52 | 50 | 45 | 43 | 43 |
| | 0400 | 48 | 58 | 43 | 54 | 52 | 50 | 46 | 44 | 43 |
| | 0500 | 48 | 58 | 44 | 53 | 50 | 49 | 47 | 46 | 45 |
| | 0600 | 51 | 65 | 45 | 57 | 53 | 52 | 49 | 47 | 46 |
| | 0700 | 51 | 65 | 47 | 58 | 54 | 53 | 51 | 49 | 47 |
| | 0800 | 50 | 59 | 44 | 56 | 54 | 53 | 50 | 47 | 45 |
| | 0900 | 50 | 67 | 41 | 57 | 54 | 52 | 48 | 45 | 43 |
| | 1000 | 51 | 62 | 43 | 60 | 55 | 53 | 49 | 46 | 44 |
| | 1100 | 50 | 61 | 43 | 57 | 54 | 53 | 49 | 46 | 45 |
| | 1200 | 52 | 66 | 46 | 62 | 55 | 54 | 50 | 47 | 46 |

Measurement Site 4
396 Queenston Blvd. - RWDL, 1997



Noise Study Field Notes

Site Number: 5

Location: 12 Armstrong Ave., rear yard

Measurement Start: August 18, 1997
15:20

Measurement Stop: August 20, 1997
15:30

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Aug 18/97 | 14:00 | 19 | 9 | E | 46 | 102.00 | Sunny |
| | 21:00 | 19 | 6 | SE | 50 | 101.95 | Clear |
| Aug 19/97 | 06:00 | 11 | 7 | N | 86 | 102.08 | A Few Clouds |
| | 14:00 | 22 | 15 | ENE | 52 | 102.04 | A Few Clouds |
| | 21:00 | 16 | 11 | ENE | 63 | 101.86 | Partly Cloudy |
| Aug 20/97 | 06:00 | 16 | 20 | NE | 80 | 101.56 | Cloudy |
| | 14:00 | 19 | 28 | ENE | 74 | 101.24 | Overcast |

* Taken from Hamilton Airport

Primary Noise Sources

- crickets, birds (sounds of nature)
- traffic from Queenston Road
- local traffic
- dogs next door (briefly)

Comments

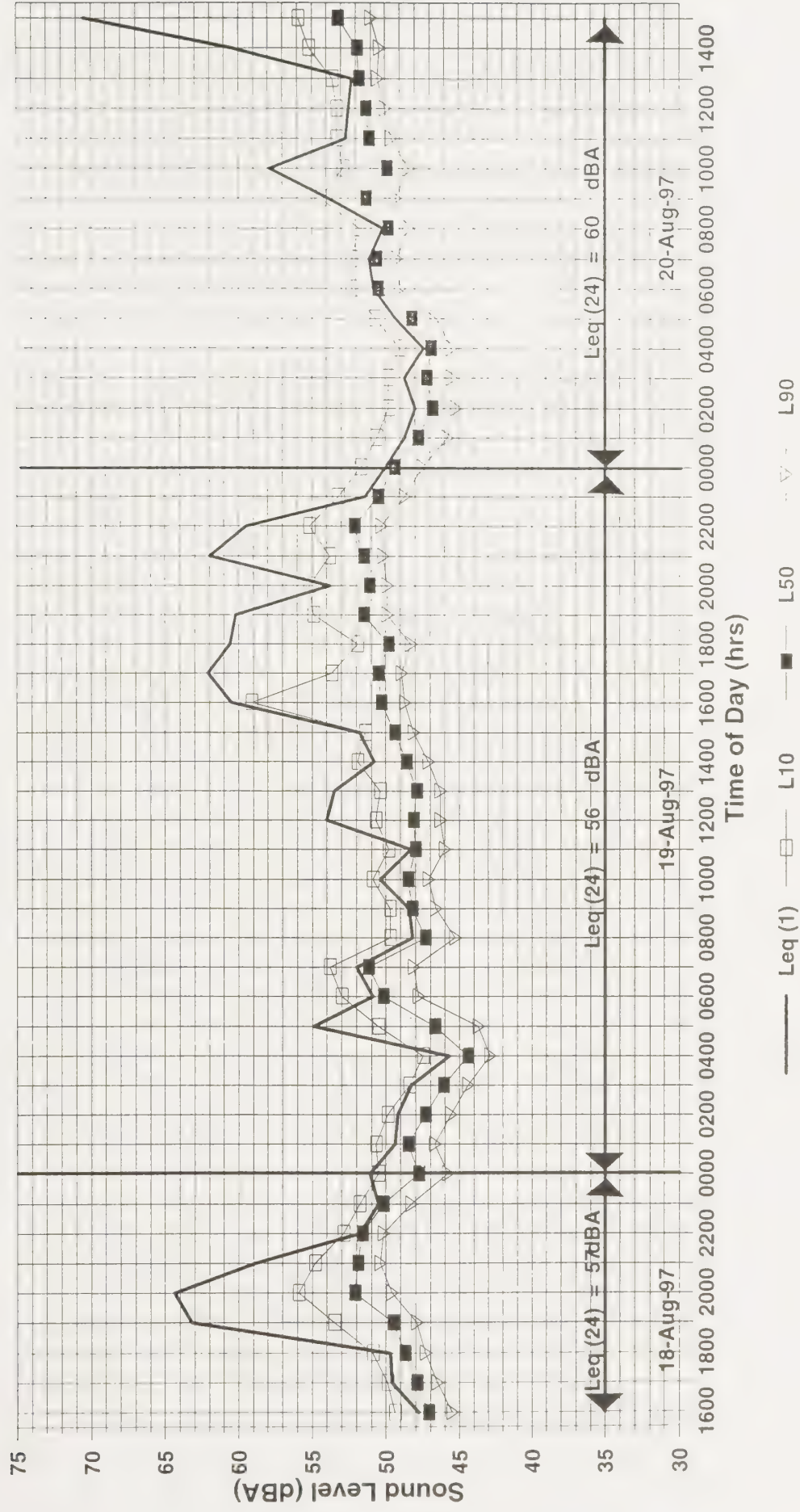
- area is residential
- Red Hill Creek Valley directly east

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 12 Armstrong Ave.
Date: August 18 to 20, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| 18-Aug-97 | 1600 | 48 | 60 | 44 | 55 | 51 | 49 | 47 | 46 | 45 |
| | 1700 | 50 | 74 | 45 | 56 | 51 | 50 | 48 | 47 | 46 |
| | 1800 | 50 | 67 | 46 | 57 | 53 | 51 | 49 | 47 | 46 |
| | 1900 | 63 | 88 | 46 | 78 | 59 | 54 | 50 | 48 | 47 |
| | 2000 | 64 | 90 | 47 | 78 | 59 | 56 | 52 | 50 | 48 |
| | 2100 | 59 | 86 | 49 | 62 | 56 | 55 | 52 | 50 | 49 |
| | 2200 | 52 | 63 | 49 | 56 | 53 | 53 | 52 | 50 | 49 |
| | 2300 | 51 | 66 | 44 | 55 | 53 | 52 | 50 | 48 | 47 |
| 19-Aug-97 | 0000 | 51 | 78 | 44 | 57 | 52 | 51 | 48 | 46 | 44 |
| | 0100 | 49 | 67 | 44 | 55 | 52 | 51 | 49 | 47 | 45 |
| | 0200 | 49 | 67 | 44 | 57 | 51 | 50 | 47 | 46 | 44 |
| | 0300 | 48 | 73 | 43 | 57 | 49 | 48 | 46 | 44 | 43 |
| | 0400 | 46 | 60 | 41 | 53 | 49 | 48 | 44 | 43 | 42 |
| | 0500 | 55 | 83 | 42 | 59 | 52 | 51 | 47 | 44 | 42 |
| | 0600 | 51 | 61 | 45 | 56 | 54 | 53 | 50 | 48 | 46 |
| | 0700 | 52 | 69 | 44 | 58 | 55 | 54 | 51 | 48 | 45 |
| | 0800 | 48 | 62 | 42 | 56 | 51 | 50 | 47 | 45 | 44 |
| | 0900 | 48 | 59 | 45 | 53 | 50 | 50 | 48 | 47 | 46 |
| | 1000 | 50 | 67 | 45 | 61 | 53 | 51 | 49 | 47 | 46 |
| | 1100 | 48 | 61 | 44 | 53 | 50 | 50 | 48 | 46 | 45 |
| | 1200 | 54 | 83 | 44 | 59 | 53 | 51 | 48 | 46 | 45 |
| | 1300 | 54 | 81 | 45 | 60 | 52 | 50 | 48 | 46 | 45 |
| | 1400 | 51 | 79 | 45 | 57 | 54 | 52 | 49 | 47 | 46 |
| | 1500 | 52 | 80 | 46 | 60 | 53 | 51 | 49 | 48 | 47 |
| | 1600 | 61 | 88 | 47 | 73 | 62 | 59 | 50 | 49 | 48 |
| | 1700 | 62 | 87 | 47 | 76 | 58 | 54 | 51 | 49 | 48 |
| | 1800 | 61 | 88 | 47 | 68 | 54 | 52 | 50 | 48 | 47 |
| | 1900 | 60 | 89 | 49 | 66 | 58 | 55 | 52 | 50 | 49 |
| | 2000 | 54 | 74 | 48 | 63 | 58 | 55 | 51 | 50 | 49 |
| | 2100 | 62 | 87 | 49 | 69 | 56 | 54 | 52 | 50 | 49 |
| | 2200 | 60 | 85 | 49 | 70 | 58 | 55 | 52 | 50 | 49 |
| | 2300 | 51 | 67 | 47 | 58 | 54 | 53 | 51 | 49 | 47 |
| 20-Aug-97 | 0000 | 50 | 60 | 46 | 55 | 53 | 52 | 49 | 48 | 46 |
| | 0100 | 49 | 58 | 44 | 56 | 52 | 51 | 48 | 46 | 45 |
| | 0200 | 48 | 65 | 44 | 54 | 51 | 50 | 47 | 45 | 44 |
| | 0300 | 49 | 69 | 44 | 57 | 52 | 50 | 47 | 46 | 45 |
| | 0400 | 47 | 56 | 44 | 52 | 50 | 49 | 47 | 46 | 45 |
| | 0500 | 49 | 68 | 45 | 54 | 52 | 51 | 48 | 47 | 46 |
| | 0600 | 51 | 62 | 47 | 55 | 53 | 52 | 51 | 49 | 48 |
| | 0700 | 51 | 65 | 48 | 57 | 53 | 52 | 51 | 49 | 48 |
| | 0800 | 50 | 59 | 47 | 54 | 53 | 52 | 50 | 48 | 48 |
| | 0900 | 54 | 77 | 48 | 60 | 56 | 54 | 51 | 49 | 48 |
| | 1000 | 58 | 84 | 46 | 68 | 56 | 53 | 50 | 48 | 47 |
| | 1100 | 53 | 81 | 48 | 57 | 54 | 53 | 51 | 50 | 49 |
| | 1200 | 53 | 69 | 48 | 62 | 55 | 53 | 51 | 50 | 49 |
| | 1300 | 52 | 73 | 49 | 56 | 54 | 54 | 52 | 51 | 50 |
| | 1400 | 61 | 86 | 49 | 74 | 62 | 55 | 52 | 50 | 49 |
| | 1500 | 71 | 91 | 49 | 86 | 62 | 56 | 53 | 51 | 49 |

Measurement Site 5
12 Armstrong Ave. - RWDI, 1997



Noise Study Field Notes

Site Number: 6

Location: 20 Parklands Dr., rear yard

Measurement Start: August 13, 1997
15:40

Measurement Stop: August 15, 1997
15:00

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Aug 13/97 | 14:00 | 21 | 22 | WNW | 83 | 101.17 | Mostly Cloudy |
| | 21:00 | 17 | 13 | WNW | 79 | 101.42 | Clear |
| Aug 14/97 | 06:00 | 9 | 9 | WSW | 98 | 101.61 | A Few Clouds |
| | 14:00 | 21 | 9 | WNW | 40 | 101.66 | Cloudy |
| | 21:00 | 18 | Calm | - | 66 | 101.47 | A Few Clouds |
| Aug 15/97 | 06:00 | 14 | 4 | ENE | 84 | 101.17 | A Few Clouds |
| | 14:00 | 23 | 32 | S | 65 | 100.61 | Overcast |

* Taken from Hamilton Airport

Primary Noise Sources

- leaves rustling, birds (sounds of nature)
- wind chime
- local traffic
- air conditioner next door

Comments

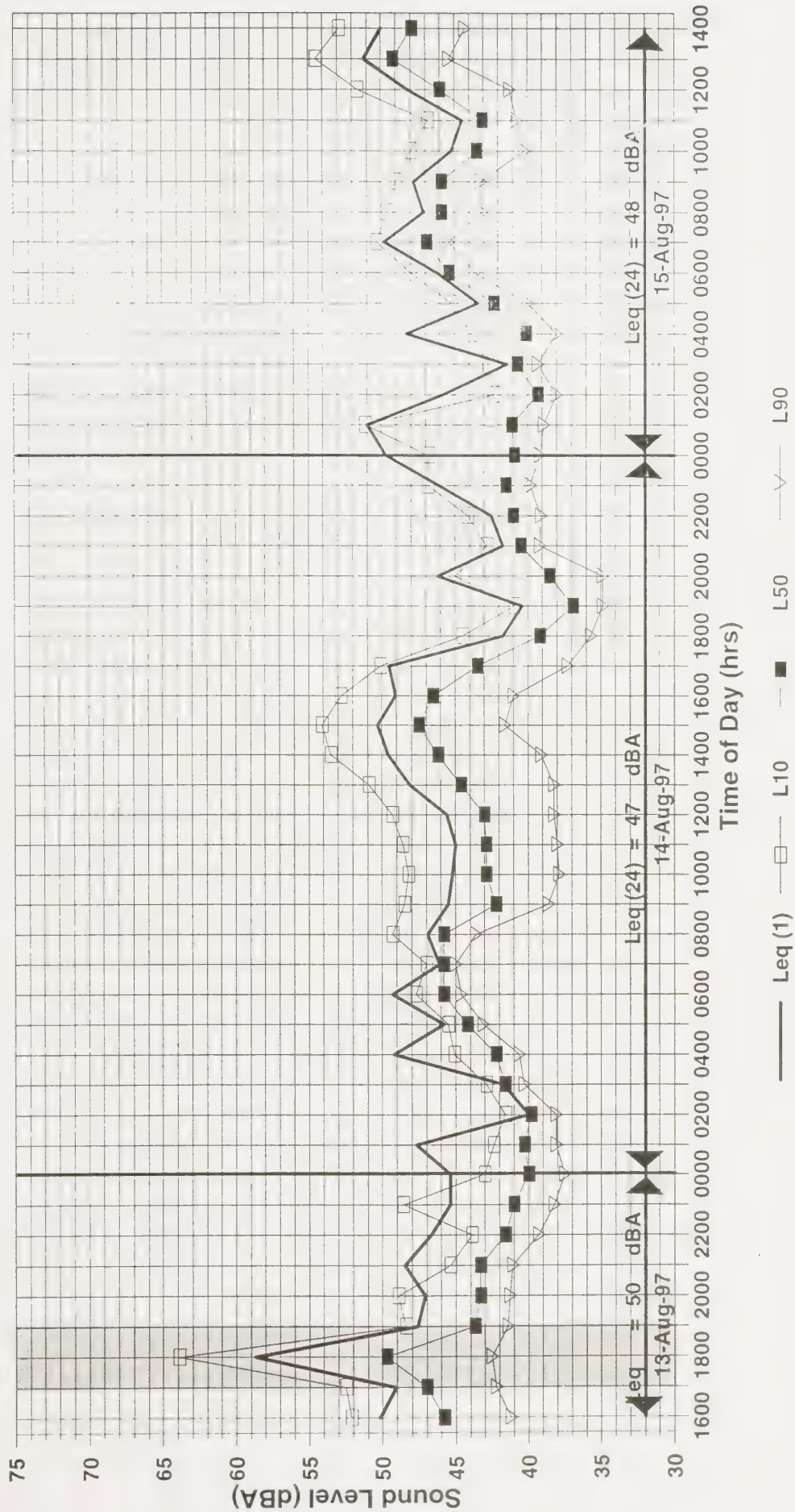
- area residential
- Red Hill Creek Valley directly east

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 20 Parklands Dr.
Date: August 13 to 15, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| 13-Aug-97 | 1600 | 50 | 71 | 37 | 60 | 54 | 52 | 46 | 41 | 39 |
| | 1700 | 49 | 62 | 38 | 57 | 54 | 53 | 47 | 42 | 40 |
| | 1800 | 59 | 68 | 39 | 67 | 65 | 64 | 50 | 43 | 40 |
| | 1900 | 48 | 65 | 37 | 58 | 52 | 48 | 44 | 41 | 38 |
| | 2000 | 47 | 64 | 39 | 58 | 52 | 49 | 43 | 41 | 40 |
| | 2100 | 49 | 71 | 39 | 55 | 47 | 45 | 43 | 41 | 39 |
| | 2200 | 47 | 66 | 38 | 60 | 48 | 44 | 42 | 39 | 38 |
| | 2300 | 45 | 64 | 37 | 55 | 51 | 49 | 41 | 38 | 37 |
| 14-Aug-97 | 0000 | 45 | 65 | 36 | 60 | 46 | 43 | 40 | 38 | 36 |
| | 0100 | 48 | 70 | 36 | 61 | 45 | 42 | 40 | 38 | 37 |
| | 0200 | 40 | 46 | 36 | 43 | 42 | 42 | 40 | 38 | 37 |
| | 0300 | 42 | 50 | 39 | 45 | 44 | 43 | 42 | 40 | 39 |
| | 0400 | 49 | 71 | 40 | 61 | 49 | 45 | 42 | 41 | 40 |
| | 0500 | 46 | 62 | 42 | 56 | 46 | 46 | 44 | 43 | 42 |
| | 0600 | 49 | 67 | 44 | 62 | 51 | 48 | 46 | 45 | 44 |
| | 0700 | 46 | 56 | 44 | 50 | 48 | 47 | 46 | 45 | 44 |
| | 0800 | 47 | 60 | 42 | 54 | 51 | 49 | 46 | 44 | 43 |
| | 0900 | 46 | 64 | 35 | 56 | 50 | 49 | 42 | 39 | 36 |
| | 1000 | 45 | 61 | 36 | 53 | 50 | 48 | 43 | 38 | 36 |
| | 1100 | 45 | 57 | 35 | 53 | 50 | 49 | 43 | 38 | 36 |
| | 1200 | 46 | 59 | 35 | 54 | 51 | 49 | 43 | 38 | 36 |
| | 1300 | 48 | 68 | 34 | 57 | 53 | 51 | 45 | 38 | 35 |
| | 1400 | 50 | 66 | 36 | 59 | 55 | 54 | 46 | 39 | 37 |
| | 1500 | 50 | 62 | 37 | 59 | 56 | 54 | 48 | 42 | 39 |
| | 1600 | 49 | 60 | 36 | 58 | 55 | 53 | 47 | 41 | 38 |
| | 1700 | 50 | 74 | 33 | 56 | 52 | 50 | 44 | 37 | 35 |
| | 1800 | 42 | 59 | 33 | 51 | 46 | 45 | 39 | 36 | 34 |
| | 1900 | 40 | 59 | 33 | 52 | 44 | 41 | 37 | 35 | 34 |
| | 2000 | 46 | 65 | 33 | 61 | 49 | 45 | 39 | 35 | 33 |
| | 2100 | 42 | 65 | 38 | 48 | 44 | 43 | 41 | 39 | 38 |
| | 2200 | 43 | 58 | 36 | 51 | 46 | 44 | 41 | 39 | 37 |
| | 2300 | 46 | 63 | 38 | 57 | 53 | 47 | 42 | 40 | 39 |
| 15-Aug-97 | 0000 | 50 | 70 | 38 | 63 | 51 | 47 | 41 | 39 | 38 |
| | 0100 | 51 | 71 | 36 | 64 | 57 | 51 | 41 | 39 | 37 |
| | 0200 | 46 | 65 | 36 | 60 | 45 | 42 | 39 | 38 | 37 |
| | 0300 | 41 | 59 | 38 | 48 | 44 | 43 | 41 | 39 | 38 |
| | 0400 | 48 | 70 | 37 | 61 | 48 | 44 | 40 | 38 | 37 |
| | 0500 | 43 | 56 | 38 | 51 | 47 | 45 | 42 | 40 | 39 |
| | 0600 | 46 | 60 | 42 | 52 | 50 | 48 | 45 | 44 | 43 |
| | 0700 | 50 | 63 | 44 | 60 | 55 | 50 | 47 | 45 | 45 |
| | 0800 | 47 | 60 | 41 | 54 | 51 | 50 | 46 | 43 | 41 |
| | 0900 | 48 | 65 | 41 | 58 | 50 | 49 | 46 | 43 | 42 |
| | 1000 | 45 | 56 | 38 | 52 | 49 | 48 | 44 | 40 | 39 |
| | 1100 | 45 | 64 | 38 | 51 | 48 | 47 | 43 | 41 | 39 |
| | 1200 | 48 | 61 | 38 | 57 | 54 | 52 | 46 | 41 | 39 |
| | 1300 | 51 | 63 | 41 | 59 | 56 | 55 | 49 | 45 | 42 |
| | 1400 | 50 | 65 | 42 | 59 | 55 | 53 | 48 | 44 | 42 |

Measurement Site 6 20 Parklands Dr. - RWDI, 1997



Notes:

- Shaded area shows high level transient event during these hours which would not reflect the normal ambient.

Noise Study Field Notes

Site Number: 11

Location: 3 Cherry Rd., rear yard

Measurement Start: October 3, 1997
14:05

Measurement Stop: October 4, 1997
15:15

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-----------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 3/97 | 14:00 | 20 | 11 | SW | 75 | 100.99 | A Few Clouds |
| | 21:00 | 15 | 7 | S | 95 | 101.21 | Clear |
| Oct 4/97 | 06:00 | 10 | 7 | ENE | 100 | 101.24 | Cloudy with Fog |
| | 14:00 | 24 | 30 | SW | 65 | 101.16 | A Few Clouds |

* Taken from Hamilton Airport

Primary Noise Sources

- traffic on Queenston Rd.
- birds, leaves rustling (sounds of nature)

Comments

- area is residential
- Red Hill Creek Valley directly west

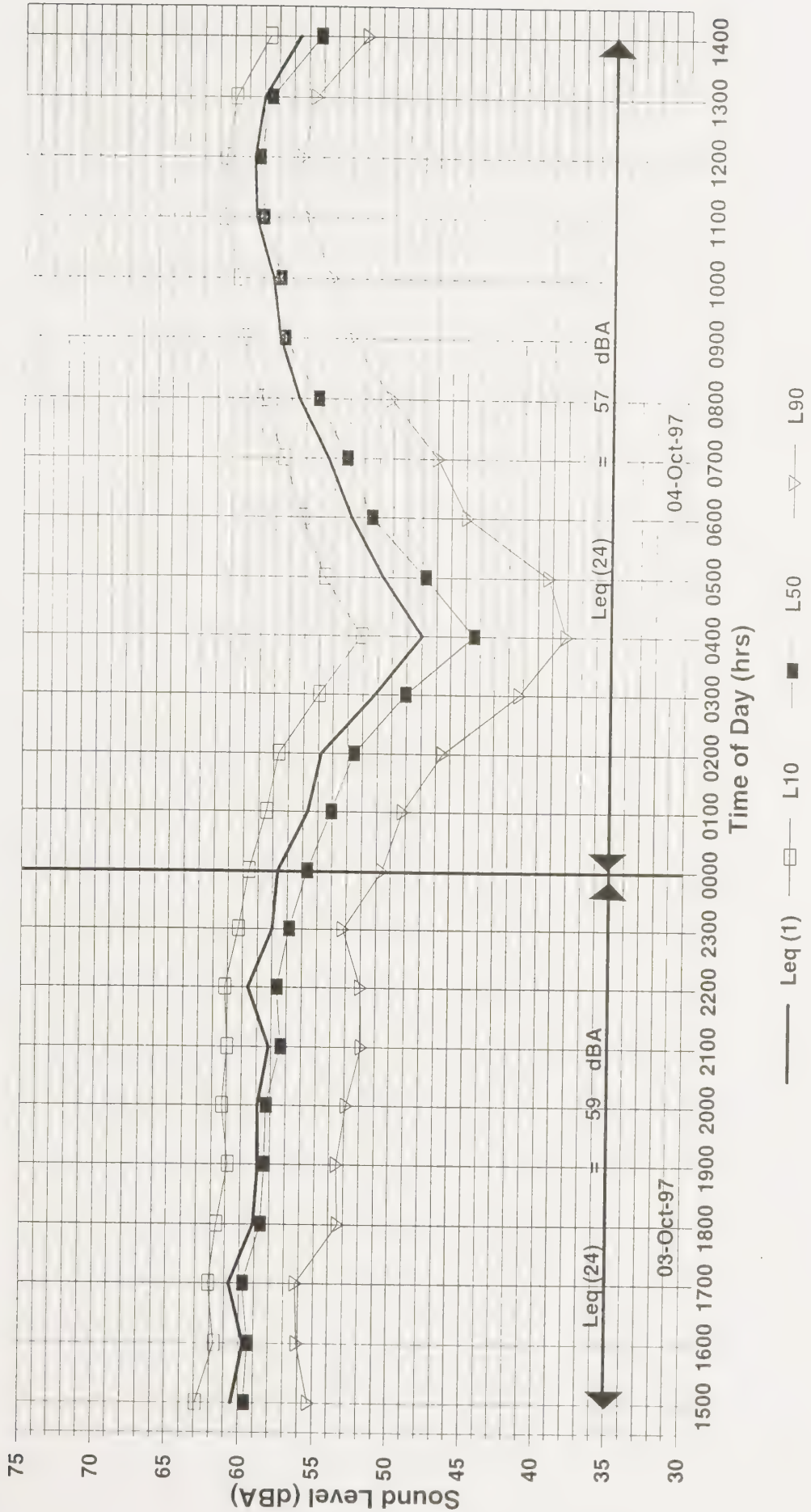
RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 3 Cherry Road

Date: October 3 to October 4, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| 03-Oct-97 | 1500 | 61 | 49 | 71 | 67 | 65 | 63 | 60 | 55 | 51 |
| | 1600 | 60 | 49 | 67 | 64 | 62 | 62 | 59 | 56 | 52 |
| | 1700 | 61 | 48 | 83 | 66 | 63 | 62 | 60 | 56 | 53 |
| | 1800 | 59 | 44 | 70 | 65 | 63 | 62 | 59 | 53 | 48 |
| | 1900 | 59 | 47 | 72 | 64 | 62 | 61 | 58 | 54 | 48 |
| | 2000 | 59 | 48 | 76 | 64 | 62 | 61 | 58 | 53 | 49 |
| | 2100 | 58 | 47 | 67 | 64 | 62 | 61 | 57 | 52 | 48 |
| | 2200 | 60 | 47 | 80 | 68 | 63 | 61 | 58 | 52 | 48 |
| | 2300 | 58 | 48 | 77 | 64 | 62 | 60 | 57 | 53 | 50 |
| 04-Oct-97 | 0000 | 58 | 47 | 79 | 65 | 61 | 60 | 56 | 51 | 47 |
| | 0100 | 56 | 45 | 69 | 64 | 60 | 59 | 54 | 49 | 46 |
| | 0200 | 55 | 41 | 73 | 63 | 59 | 58 | 53 | 47 | 43 |
| | 0300 | 51 | 38 | 62 | 59 | 56 | 55 | 49 | 41 | 39 |
| | 0400 | 48 | 36 | 60 | 57 | 54 | 52 | 44 | 38 | 37 |
| | 0500 | 51 | 37 | 63 | 59 | 56 | 55 | 48 | 39 | 37 |
| | 0600 | 53 | 39 | 66 | 60 | 58 | 56 | 52 | 45 | 41 |
| | 0700 | 55 | 41 | 68 | 62 | 59 | 58 | 53 | 47 | 43 |
| | 0800 | 57 | 43 | 76 | 63 | 60 | 59 | 55 | 50 | 45 |
| | 0900 | 58 | 45 | 66 | 63 | 61 | 60 | 58 | 53 | 48 |
| | 1000 | 58 | 49 | 68 | 63 | 61 | 61 | 58 | 54 | 51 |
| | 1100 | 60 | 50 | 70 | 64 | 63 | 62 | 59 | 56 | 53 |
| | 1200 | 60 | 51 | 67 | 64 | 62 | 62 | 59 | 56 | 53 |
| | 1300 | 59 | 49 | 71 | 65 | 62 | 61 | 59 | 56 | 52 |
| | 1400 | 57 | 41 | 83 | 62 | 60 | 59 | 55 | 52 | 49 |

Measurement Site 11
3 Cherry Road - RWDI, 1997



Noise Study Field Notes

Site Number: 12

Location: 255 Pottruff Rd., rear yard

Measurement Start: October 2, 1997
12:05

Measurement Stop: October 3, 1997
13:15

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|----------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 2/97 | 14:00 | 12 | 19 | SSW | 80 | 101.74 | Cloudy |
| | 21:00 | 11 | 17 | SW | 90 | 101.37 | Cloudy |
| Oct 3/97 | 06:00 | 13 | 19 | SW | 90 | 101.01 | Overcast |

* Taken from Hamilton Airport

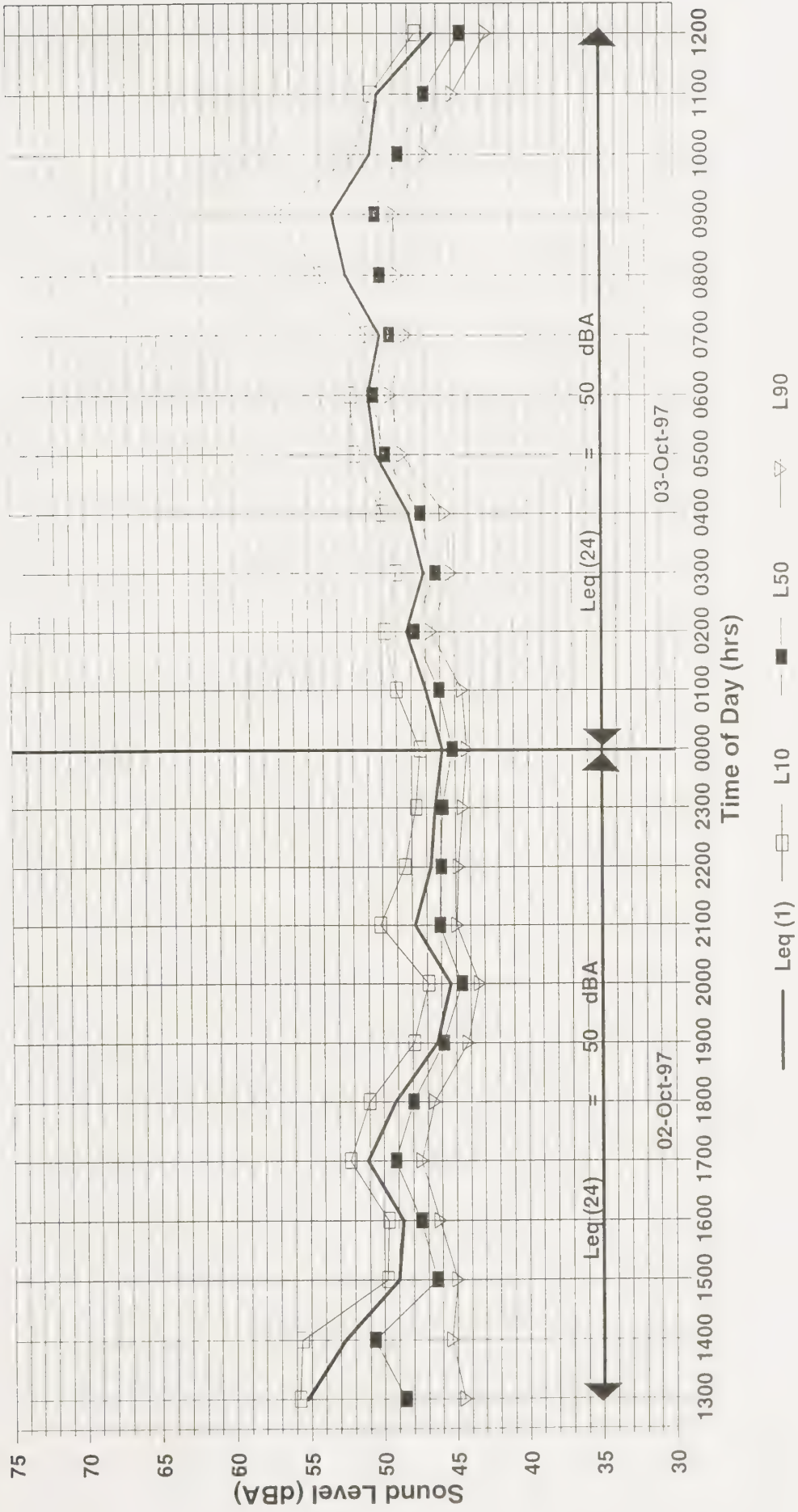
Primary Noise Sources

- birds, crickets, leaves rustling (sounds of nature)
- traffic on Queenston Rd., Barton St., and Pottruff Rd.
- dog next door

Comments

- area residential
- Red Hill Creek Valley directly west

Measurement Site 12 255 Pottruff Road North - RWDI, 1997



Noise Study Field Notes

Site Number: 14

Location: 21 Embury Crt., rear yard

Measurement Start: October 1, 1997
10:50

Measurement Stop: October 2, 1997
11:10

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 1/97 | 14:00 | 10 | 19 | NW | 60 | 101.82 | A Few Clouds |
| | 21:00 | 6 | 15 | NW | 80 | 101.99 | Clear |
| Oct 2/97 | 06:00 | 1 | 7 | W | 100 | 101.98 | Partly Cloudy |

* Taken from Hamilton Airport

Primary Noise Sources

- trains from CN line
- truck back-up beepers from nearby industry
- traffic on QEW
- leaves rustling, birds, crickets (sounds of nature)

Comments

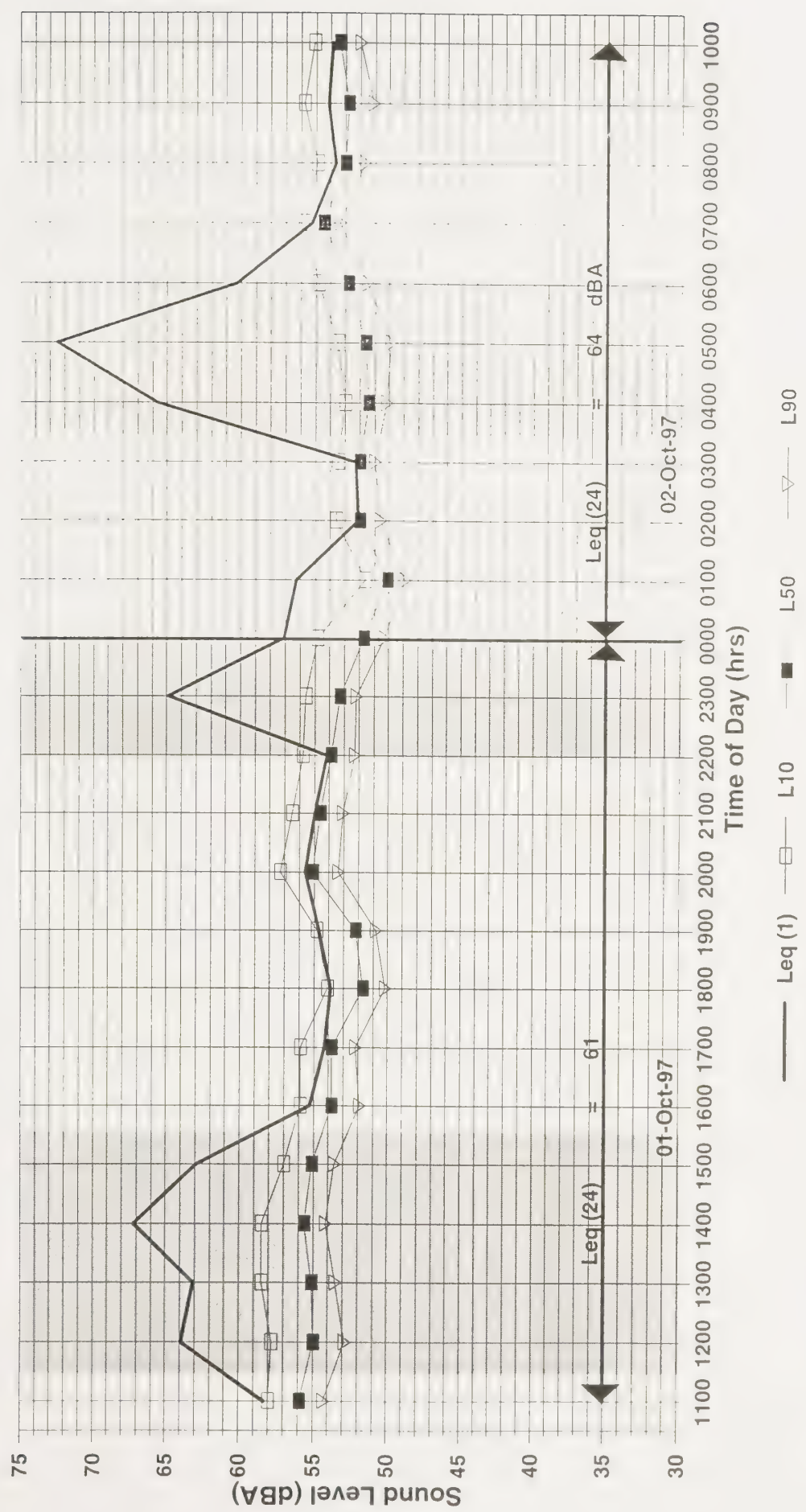
- area is residential
- Red Hill Creek Valley directly east
- industry to the south and east
- CN rail line running E/W is approx. 100 m south

RED HILL CREEK EXPRESSWAY - AMBIENT MONITORING PROGRAM

Site: 21 Embury Court
Date: October 1 to October 2, 1997

| Date | Hour Beginning | Leq (1) | Lmin | Lmax | L1 | L5 | L10 | L50 | L90 | L99 |
|-----------|-------------------|---------|------|------|----|----|-----|-----|-----|-----|
| 01-Oct-97 | 1100 | 58 | 51 | 80 | 63 | 59 | 58 | 56 | 54 | 53 |
| | 1200 | 64 | 51 | 95 | 69 | 59 | 58 | 55 | 53 | 51 |
| | 1300 | 63 | 52 | 82 | 77 | 65 | 59 | 55 | 54 | 53 |
| | 1400 | 67 | 53 | 96 | 76 | 62 | 59 | 56 | 54 | 53 |
| | 1500 | 63 | 52 | 93 | 75 | 58 | 57 | 55 | 54 | 53 |
| | 1600 | 55 | 50 | 75 | 60 | 57 | 56 | 54 | 52 | 50 |
| | 1700 | 54 | 51 | 69 | 58 | 57 | 56 | 54 | 52 | 51 |
| | 1800 | 54 | 49 | 76 | 58 | 55 | 54 | 52 | 50 | 49 |
| | 1900 | 55 | 49 | 78 | 58 | 56 | 55 | 52 | 51 | 50 |
| | 2000 | 56 | 52 | 64 | 60 | 58 | 57 | 55 | 53 | 52 |
| | 2100 | 55 | 51 | 63 | 60 | 57 | 57 | 55 | 53 | 52 |
| | 2200 | 54 | 51 | 61 | 58 | 56 | 56 | 54 | 52 | 51 |
| | 2300 | 65 | 51 | 84 | 78 | 73 | 56 | 53 | 52 | 51 |
| 02-Oct-97 | 0000 | 57 | 49 | 76 | 72 | 56 | 55 | 52 | 50 | 49 |
| | 0100 | 56 | 47 | 78 | 65 | 52 | 52 | 50 | 49 | 48 |
| | 0200 | 52 | 49 | 57 | 55 | 54 | 54 | 52 | 51 | 50 |
| | 0300 | 52 | 50 | 58 | 55 | 54 | 54 | 52 | 51 | 50 |
| | 0400 | 66 | 49 | 91 | 75 | 66 | 53 | 51 | 50 | 49 |
| | 0500 | 73 | 48 | 99 | 77 | 55 | 54 | 52 | 50 | 49 |
| | 0600 | 60 | 51 | 83 | 74 | 58 | 55 | 53 | 52 | 51 |
| | 0700 | 55 | 53 | 72 | 61 | 57 | 56 | 55 | 53 | 53 |
| | 0800 | 54 | 51 | 67 | 60 | 56 | 55 | 53 | 52 | 51 |
| | 0900 | 54 | 49 | 67 | 62 | 58 | 56 | 53 | 51 | 50 |
| | 1000 | 54 | 50 | 69 | 59 | 56 | 55 | 53 | 52 | 51 |

Measurement Site 14 21 Embury Court - RWDI, 1997



Notes:
 - Shaded area shows high level transient events (train pass-bys) during these hours which would not reflect the normal ambient.

SHORT-DURATION MONITORING RESULTS

Noise Study Field Notes - Short Term Monitoring

Site Number: 7

Location: 38 Jamie Anne Crt., rear yard

Measurement Start: July 30, 1997
09:20

Measurement Stop: July 30, 1997
09:50

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-------|
| | | | Speed (km/hr) | Direction | | | |
| Jul 30/97 | 09:00 | 18 | 6 | SW | 77 | 102.64 | Clear |

* Taken from Hamilton Airport

Measurement Data*

| L_{eq} | L_{10} | L_{50} | L_{90} | Duration |
|----------|----------|----------|----------|----------|
| 45 | 46 | 44 | 43 | 25.7 min |

* All measurement results are in dBA.

Primary Noise Sources

- birds
- heat pump
- neighbours pool pump
- construction activities nearby

Comments

- area residential
- construction from Red Hill Creek Expressway East-West Section is audible

Noise Study Field Notes - Short Term Monitoring

Site Number: 8

Location: 108 Albion Falls Blvd.

Measurement Start: April 2, 1997
15:55

Measurement Stop: April 2, 1997
16:15

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-------|
| | | | Speed (km/hr) | Direction | | | |
| Apr 2/97 | 16:00 | 15.7 | 18 | W | 32 | 102.39 | Clear |

* Taken from Hamilton Airport

Measurement Data*

| L_{eq} | L_{10} | L_{50} | L_{90} | Duration |
|----------|----------|----------|----------|----------|
| 49 | 51 | 48 | 45 | 20 min |

* All measurement results are in dBA.

Primary Noise Sources

- birds, water in Red Hill Creek, sounds of nature
- road traffic on Mud St./Mountain Brow

Comments

- area is residential

Noise Study Field Notes - Short Term Monitoring

Site Number: 9

Location: 56 Forest Hill Cres., rear yard

Measurement Start: July 30, 1997
10:25

Measurement Stop: July 30, 1997
10:55

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-------|
| | | | Speed (km/hr) | Direction | | | |
| Jul 30/97 | 10:00 | 21 | 7 | WSW | 61 | 102.64 | Clear |

* Taken from Hamilton Airport

Measurement Data*

| L_{eq} | L_{10} | L_{50} | L_{90} | Duration |
|----------|----------|----------|----------|----------|
| 39 | 41 | 38 | 36 | 28.4 min |

* All measurement results are in dBA.

Primary Noise Sources

- birds, sounds of nature
- buzzing from power lines overhead
- traffic from Mt. Albion Rd.

Comments

- area is residential
- unable to get access to rear yard of 64 Forest Hill Cres., the original location of site 9
- 56 Forest Hill Cres. is two houses north
- undeveloped lands directly west

Noise Study Field Notes - Short Term Monitoring

Site Number: 10

Location: 20 Beland Crt., rear yard

Measurement Start: July 30, 1997
11:30

Measurement Stop: July 30, 1997
12:00

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-------|
| | | | Speed (km/hr) | Direction | | | |
| Jul 30/97 | 11:00 | 23 | 9 | W | 56 | 102.64 | Clear |

* Taken from Hamilton Airport

Measurement Data*

| L_{eq} | L_{10} | L_{50} | L_{90} | Duration |
|----------|----------|----------|----------|----------|
| 51 | 53 | 50 | 47 | 30.3 min |

* All measurement results are in dBA.

Primary Noise Sources

- birds, leaves rustling, cicadas (sounds of nature)
- traffic on King St.

Comments

- area is residential
- unable to get access to rear yard of 21 Beland Crt., the original location of site 10
- 20 Beland Crt. is next door
- Red Hill Creek Valley directly east

Noise Study Field Notes - Short Term Monitoring

Site Number: 13

Location: 348 Pottruff Rd., rear yard

Measurement Start: July 30, 1997
15:00

Measurement Stop: July 30, 1997
15:25

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Jul 30/97 | 15:00 | 26 | 20 | NE | 37 | 102.50 | A Few Clouds |

* Taken from Hamilton Airport

Measurement Data*

| L_{eq} | L_{10} | L_{50} | L_{90} | Duration |
|----------|----------|----------|----------|----------|
| 55 | 57 | 53 | 50 | 25 min |

* All measurement results are in dBA.

Primary Noise Sources

- children playing
- traffic on Nash Rd. and Barton St.
- leaves rustling (sounds of nature)

Comments

- area is residential
- unable to get access to rear yard of 350 Pottruff Rd., the original location of site 13
- 348 Pottruff Rd. is next door

Noise Study Field Notes - Short Term Monitoring

Site Number: 15

Location: 36 Sinclair Crt., rear yard

Measurement Start: August 6, 1997
10:15

Measurement Stop: August 6, 1997
10:45

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Aug 6/97 | 10:00 | 17 | 6 | NNW | 58 | 102.11 | A Few Clouds |

* Taken from Hamilton Airport

Measurement Data*

| L_{eq} | L_{10} | L_{50} | L_{90} | Duration |
|----------|----------|----------|----------|----------|
| 46 | 48 | 45 | 42 | 30.2 min |

* All measurement results are in dBA.

Primary Noise Sources

- traffic on Lawrence Rd.
- cicadas, birds, dog barking in distance

Comments

- area is residential
- Red Hill Creek Valley directly east

Noise Study Field Notes - Short Term Monitoring

Site Number: A

Location: Lakeland Community Center Parking Lot along Beach Rd.

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|-------------------------------|-------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 9:05 am | Fri. Oct. 10, 1997 9:25 am | 69.9 | 66.3 | 73.5 | 20.0 min |
| Tues. Oct 14, 1997 3:40 pm | Tues. Oct 14, 1997 4:00 pm | 69.4 | 65.3 | 74.0 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 9:00 | 12 | 22 | WSW | 89 | 101.45 | Clear |
| Oct 14/97 | 15:00 | 15 | 30 | WNW | 44 | 102.09 | Partly Cloudy |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- traffic from QEW
- traffic from Beach Rd.
- birds

Primary Noise Sources on Oct. 14, 1997

- traffic from QEW
- traffic from Beach Rd

Comments

- QEW is 100-150 m west
- Lake Ontario is 50 m east

Noise Study Field Notes - Short Term Monitoring

Site Number: B

Location: Confederation Park near fenceline, self service entrance and line of 11 flagpoles

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|-------------------------------|--------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 9:45 am | Fri. Oct. 10, 1997 10:05 am | 66.1 | 60.3 | 81.8 | 20.0 min |
| Tues. Oct 14, 1997 4:40 pm | Tues. Oct 14, 1997 5:00 pm | 65.5 | 61.3 | 74.3 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 10:00 | 13 | 28 | W | 77 | 102.49 | Clear |
| Oct 14/97 | 16:00 | 14 | 20 | W | 44 | 102.10 | Partly Cloudy |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- traffic from QEW
- traffic from Confederation Rd.
- leaves rustling
- flag poles clanging

Primary Noise Sources on Oct. 14, 1997

- traffic from QEW
- traffic from Confederation Rd.
- leaves rustling
- flag poles clanging

Comments

- QEW is 200 m east
- Lake Ontario is 100 m west

Noise Study Field Notes - Short Term Monitoring

Site Number: C

Location: Entrance to Globe Park at end of Brampton St.

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|--------------------------------|--------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 10:20 am | Fri. Oct. 10, 1997 10:40 am | 55.0 | 51.1 | 64.0 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|-------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 10:00 | 13 | 28 | W | 77 | 102.49 | Clear |

* Taken from Hamilton Airport

Primary Noise Sources

- sewage treatment plant
- leaves rustling
- crickets, seagulls
- traffic on Woodward Ave.
- industry noises

Comments

- Globe Park was closed, hence equipment setup at entrance
- Sewage treatment plant nearby

Noise Study Field Notes - Short Term Monitoring

Site Number: D

Location: Hillcrest Park, 50 m south of Melvin Ave. near log jump

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|--------------------------------|--------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 11:10 am | Fri. Oct. 10, 1997 11:30 am | 51.8 | 47.5 | 62.3 | 20.0 min |
| Sun. Oct. 12, 1997 1:50 pm | Sun. Oct. 12, 1997 2:10 pm | 50.8 | 46.5 | 59.0 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 11:00 | 14 | 32 | WNW | 72 | 102.57 | A few clouds |
| Oct 12/97 | 14:00 | 20 | 13 | S | 52 | 102.28 | A few clouds |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- traffic from Melvin Ave., Barton St., and Woodward Ave.
- crickets
- leaves rustling

Primary Noise Sources on Oct. 12, 1997

- traffic from Melvin Ave. and Barton St.
- kids playing in nearby backyard
- crickets, birds, and dogs

Comments

- area is recreational surrounded by residential

Noise Study Field Notes - Short Term Monitoring

Site Number: E

Location: Red Hill Bowl Park, near stairs

Measurement Data*

| Measurement Start | Measurement Stop | L_{eq} | L_{min} | L_{max} | Duration |
|--------------------------------|--------------------------------|----------|-----------|-----------|----------|
| Fri. Oct. 10, 1997 11:50 am | Fri. Oct. 10, 1997 12:10 am | 46.3 | 41.5 | 58.5 | 20.0 min |
| Sun. Oct. 12, 1997 3:00 pm | Sun. Oct. 12, 1997 3:20 pm | 44.8 | 40.3 | 55.3 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 12:00 | 15 | 24 | W | 64 | 102.60 | A few clouds |
| Oct 12/97 | 15:00 | 20 | 17 | SSE | 47 | 102.20 | Partly cloudy |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- leaves rustling
- crickets, crows, blue jays, and dog barking
- traffic on King St.

Primary Noise Sources on Oct. 12, 1997

- traffic on King St.
- leaves rustling
- crickets
- car alarm on Lucerne St. for 20 seconds
- people in park

Comments

- area is recreational surrounded by residential
- King St. is 200 m south

Noise Study Field Notes - Short Term Monitoring

Site Number: F

Location: Hixon Bowl Park, 40 m east of footbridge at trail crossroads

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|--------------------------------|-------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 12:55 pm | Fri. Oct. 10, 1997 1:15 pm | 49.4 | 47.0 | 52.6 | 20.0 min |
| Sun. Oct. 12, 1997 3:40 pm | Sun. Oct. 12, 1997 4:00 pm | 50.2 | 46.4 | 58.3 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 13:00 | 16 | 24 | W | 56 | 102.60 | A few clouds |
| Oct 12/97 | 15:00 | 20 | 17 | SSE | 47 | 102.20 | Partly cloudy |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- leaves rustling
- crickets, birds, cicadas
- leaf blower in distance

Primary Noise Sources on Oct. 12, 1997

- leaves rustling
- crickets
- distant traffic
- kids playing on nearby railway bridge

Comments

- CP railway bridge is 100 m south
- Red Hill Creek is 40 m west

Noise Study Field Notes - Short Term Monitoring

Site Number: G

Location: Red Hill Valley Recreation Trail, Mt. Albion entrance about 100 m down the trail near old utility pole

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|--------------------------------|--------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 2:00 pm | Fri. Oct. 10, 1997 2:20 pm | 51.4 | 49.3 | 56.0 | 20.0 min |
| Sun. Oct. 12, 1997 12:25 pm | Sun. Oct. 12, 1997 12:45 pm | 51.6 | 48.9 | 56.3 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 14:00 | 17 | 26 | WNW | 54 | 102.57 | A few clouds |
| Oct 12/97 | 12:00 | 17 | 11 | SSE | 67 | 102.37 | A few clouds |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- leaves rustling
- crickets, birds, cicadas, frogs
- traffic on Mt. Albion Rd.

Primary Noise Sources on Oct. 12, 1997

- leaves rustling
- crickets, cicadas, frogs
- people on trail
- traffic on Mt. Albion Rd.

Noise Study Field Notes - Short Term Monitoring

Site Number: H

Location: Red Hill Valley Recreation Trail, Mud Street entrance about 150 m down the trail until it splits into cycling and walking trails

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|--------------------------------|--------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 2:40 pm | Fri. Oct. 10, 1997 3:00 pm | 52.6 | 50.3 | 56.5 | 20.0 min |
| Sun. Oct. 12, 1997 11:40 am | Sun. Oct. 12, 1997 12:25 pm | 53.4 | 49.9 | 57.5 | 15.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 14:00 | 17 | 26 | WNW | 54 | 102.57 | A few clouds |
| Oct 12/97 | 12:00 | 17 | 11 | SSE | 67 | 102.37 | A few clouds |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- leaves rustling
- crickets
- traffic on Mt. Brow Blvd.

Primary Noise Sources on Oct. 12, 1997

- leaves rustling
- crickets, birds (woodpecker peeping loudly for about 1 minute)
- people on trail
- traffic on Mt. Brow Blvd.

Comments

- On Oct. 12 only able to get 15 minutes of readings because of heavy human traffic on the trail

Noise Study Field Notes - Short Term Monitoring

Site Number: I

Location: Off Mt. Brow Blvd. in Kings Forest Park between Mohawk Rd. and Limeridge Rd. on Bruce trail side trail, across from Mohawk Sports Park on edge of escarpment

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|--------------------------------|--------------------------------|-----------------|------------------|------------------|----------|
| Fri. Oct. 10, 1997 3:15 pm | Fri. Oct. 10, 1997 3:35 pm | 51.5 | 45.0 | 59.8 | 20.0 min |
| Sun. Oct. 12, 1997 11:00 am | Sun. Oct. 12, 1997 11:20 am | 48.3 | 42.3 | 58.9 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 15:00 | 17 | 17 | W | 57 | 102.57 | A few clouds |
| Oct 12/97 | 11:00 | 15 | 11 | S | 76 | 102.43 | Clear |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- traffic on Mt. Brow Blvd.
- leaves rustling
- crickets

Primary Noise Sources on Oct. 12, 1997

- leaves rustling
- crickets, birds (crow very loud nearby for about 5 minutes)
- people in valley trails
- traffic on Mt. Brow Blvd.

Noise Study Field Notes - Short Term Monitoring

Site Number: J

Location: Kings Forest Golf Course down in the turf care center parking lot

Measurement Data*

| Measurement Start | Measurement Stop | L_{eq} | L_{min} | L_{max} | Duration |
|-------------------------------|-------------------------------|----------|-----------|-----------|----------|
| Fri. Oct. 10, 1997 4:10 pm | Fri. Oct. 10, 1997 4:30 pm | 42.9 | 39.5 | 53.5 | 20.0 min |
| Sun. Oct. 12, 1997 4:15 pm | Sun. Oct. 12, 1997 4:35 am | 43.5 | 40.3 | 58.3 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 16:00 | 16 | 22 | NNW | 59 | 102.59 | A few clouds |
| Oct 12/97 | 16:00 | 19 | 19 | ENE | 60 | 102.13 | A few clouds |

* Taken from Hamilton Airport

Primary Noise Sources on Oct. 10, 1997

- leaves rustling
- crickets, birds
- golfers

Primary Noise Sources on Oct. 12, 1997

- leaves rustling
- crickets, birds (blue jay very loud nearby at one point)
- loud banging from clubhouse (once)

Comments

- no apparent traffic noise at this location

Noise Study Field Notes - Short Term Monitoring

Site Number: K

Location: Glencastle park near soccer posts

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|-------------------------------|-------------------------------|-----------------|------------------|------------------|----------|
| Sun. Oct. 12, 1997 1:00 pm | Sun. Oct. 12, 1997 1:20 pm | 42.3 | 37.5 | 59.3 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 10/97 | 13:00 | 19 | 11 | S | 57 | 102.30 | Partly Cloudy |

* Taken from Hamilton Airport

Primary Noise Sources

- birds, crickets
- leaves rustling
- kids talking and playing
- dogs barking very loud at one instance

Noise Study Field Notes - Short Term Monitoring

Site Number: L

Location: Hutchs Restaurant parking lot

Measurement Data*

| Measurement Start | Measurement Stop | L_{eq} | L_{min} | L_{max} | Duration |
|--------------------------------|--------------------------------|----------|-----------|-----------|----------|
| Tues. Oct. 14, 1997 4:10 pm | Tues. Oct. 14, 1997 4:30 pm | 65.7 | 59.3 | 72.0 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|---------------|
| | | | Speed (km/hr) | Direction | | | |
| Oct 14/97 | 16:00 | 14 | 20 | W | 44 | 102.10 | Partly Cloudy |

* Taken from Hamilton Airport

Primary Noise Sources

- traffic on QEW
- traffic on Beach Rd.
- seagulls and other birds
- traffic in parking lot
- leaves rustling

Comments

- QEW 150-200 m east
- Burlington St. on/off ramp partially blocks QEW from sight

Noise Study Field Notes - Short Term Monitoring

Site Number: M

Location: Greenhill Bowl Park

Measurement Data*

| Measurement Start | Measurement Stop | L _{eq} | L _{min} | L _{max} | Duration |
|------------------------------|------------------------------|-----------------|------------------|------------------|----------|
| Wed. Aug 6, 1997 11:10 am | Wed. Aug 6, 1997 11:40 am | 39.3 | 34.5 | 50.1 | 27.6 min |
| Sun. Oct 12, 1997 4:45 pm | Sun. Oct 12, 1997 5:05 pm | 41.1 | 38.5 | 54.5 | 20.0 min |

* All measurement results are in dBA.

Weather Data*

| Date | Time | Temperature (°C) | Wind | | Relative Humidity (%) | Atmospheric Pressure (kPa) | Sky |
|-----------|-------|---------------------|------------------|-----------|-----------------------------|----------------------------------|--------------|
| | | | Speed (km/hr) | Direction | | | |
| Aug 6/97 | 11:00 | 19 | 7 | WNW | 46 | 102.12 | A Few Clouds |
| Oct 12/97 | 16:00 | 19 | 19 | ENE | 60 | 102.13 | A Few Clouds |

* Taken from Hamilton Airport

Primary Noise Sources on Aug 6, 1997

- leaves rustling
- cicadas, birds
- traffic in park (cars, cyclists)

Primary Noise Sources on Oct. 12, 1997

- leaves rustling
- crickets, crows
- kids playing near creek

Comments

- recreational area
- Red Hill Creek 50 m east

APPENDIX D

APPENDIX D

EXCERPTS FROM APPENDIX C OF 1980 VALCOUSTICS REPORT

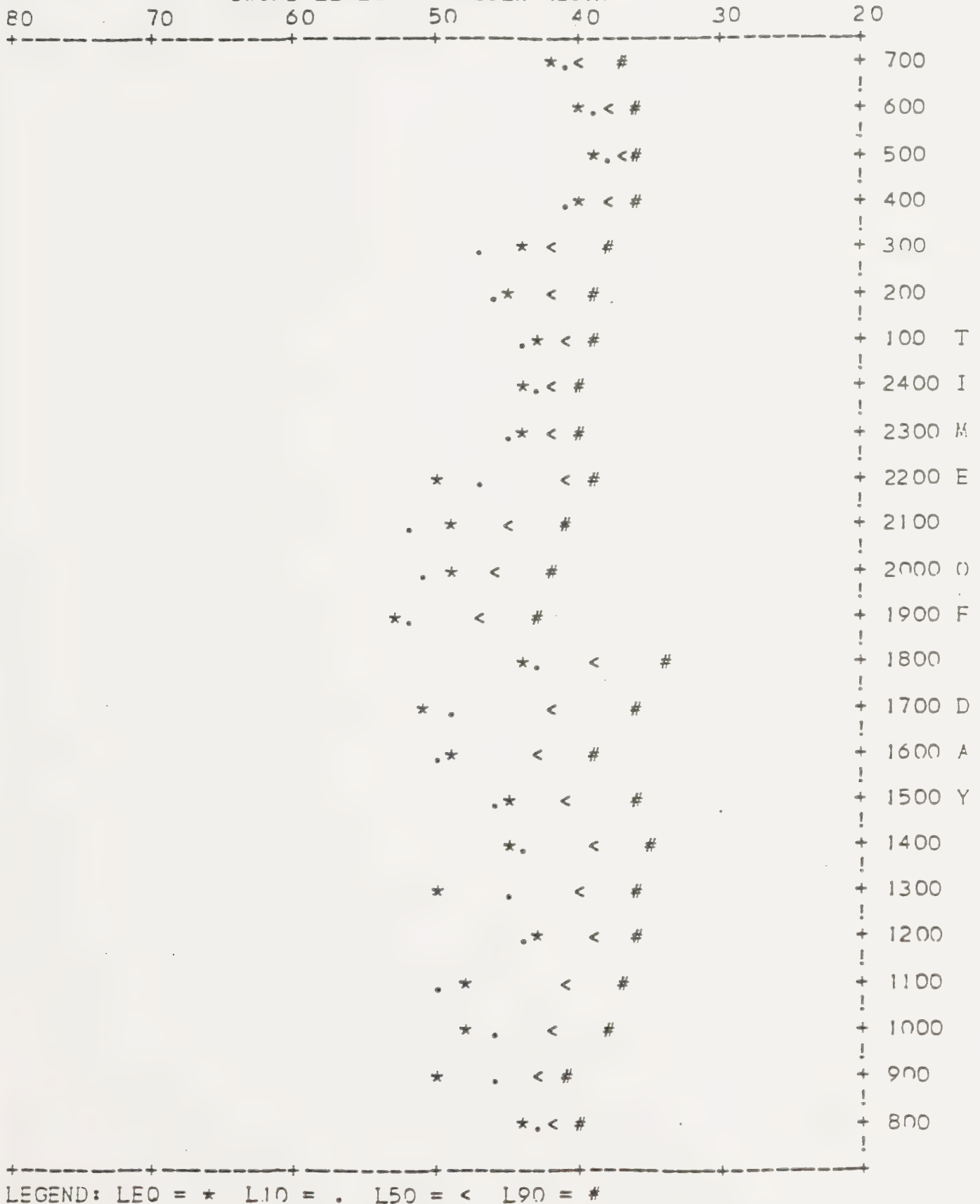
HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|--|---|---------|------|----------|----------|--------|
| Site No. 7 | Location 32 Jamie Anne Crt., rear yard | | | | | |
| Dates 1980 06 04/05 | | | | | | |
| Start Time 17:50 | Weather at 1980 06 05 16:30 | | | | | |
| Stop Time 19:15 | Temp. | Wind | | Humidity | Pressure | Sky |
| Inhibit Duration 2 min. | | Speed | Dir. | | | |
| | 20.4 | 10 km/h | E | 35% | 102.1kPa | Broken |
| <p>Primary Noise Sources</p> <ul style="list-style-type: none"> - Limeridge Road E. traffic - Dump truck 10:30 - Approximately 30 m from measurement point - Dump truck 15:50 - Approximately 30 m from measurement point | | | | | | |
| <p>Comments</p> <p>Area - generally underdeveloped lands to the west and south and beyond Limeridge Road to the north and beyond Jamie Anne Crt. to the east. E/W and N/S transportation corridor to the south.</p> | | | | | | |

HAMILTON TRANSPORTATION CORRIDOR

SITE NO:7 1980 06 04/05

SOUND LEVEL PARAMETER (DBA)



HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|---|--|--------|-------|----------|----------|-------|
| Site No. 8 | Location 108 Albion Falls Blvd. Rear yard | | | | | |
| Dates 1980 05 22/23 | | | | | | |
| Start Time 14:55 | Weather at 20:00 1980 05 22 | | | | | |
| Stop Time 15:25 | Temp. | Wind | | Humidity | Pressure | Sky |
| Inhibit Duration None | | Speed | Dir. | | | |
| | 24°C | 9 km/h | W/S/W | 57% | 101.6KPa | Clear |
| Primary Noise Sources - Mountain Brow Blvd. traffic - Mud Street traffic - Birds | | | | | | |
| Comments Area - Residential in the immediate vicinity to the north, west, and east. Rear yard overlooks Red Hill Creek valley and E/W and N/S transportation Corridor, to the south. | | | | | | |

SITE NO: 8 1980 05 22/23

VALCOUSTICS CANADA LTD

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDOR

ENVIRONMENTAL NOISE STUDY

| TIME | 24 h Measurements | | |
|--------------|-------------------|-----------------|-----------------|
| | L _{eq} | L ₁₀ | L ₅₀ |
| 07:00-08:00 | 60 | 58 | 50 |
| 08:00-09:00 | 53 | 54 | 51 |
| 09:00-10:00 | 50 | 52 | 48 |
| 10:00-11:00 | 52 | 53 | 48 |
| 11:00-12:00 | 49 | 50 | 46 |
| 12:00-13:00 | 50 | 51 | 47 |
| 13:00-14:00 | 49 | 50 | 46 |
| 14:00-15:00 | 49 | 51 | 47 |
| *15:00-16:00 | 52 | 53 | 49 |
| 16:00-17:00 | 52 | 52 | 50 |
| 17:00-18:00 | 52 | 52 | 49 |
| 18:00-19:00 | 54 | 55 | 48 |
| 19:00-20:00 | 52 | 53 | 48 |
| 20:00-21:00 | 58 | 53 | 48 |
| 21:00-22:00 | 49 | 49 | 46 |
| 22:00-23:00 | 47 | 47 | 45 |
| 23:00-24:00 | 46 | 47 | 44 |
| 24:00-01:00 | 44 | 46 | 42 |
| 01:00-02:00 | 42 | 43 | 40 |
| 02:00-03:00 | 40 | 41 | 38 |
| 03:00-04:00 | 40 | 40 | 38 |
| 04:00-05:00 | 41 | 41 | 39 |
| 05:00-06:00 | 47 | 47 | 42 |
| 06:00-07:00 | 48 | 49 | 46 |
| | | | 46 |
| | | | 49 |
| | | | 45 |
| | | | 44 |
| | | | 43 |
| | | | 43 |
| | | | 44 |
| | | | 47 |
| | | | 47 |
| | | | 46 |
| | | | 45 |
| | | | 45 |
| | | | 43 |
| | | | 42 |
| | | | 41 |
| | | | 39 |
| | | | 38 |
| | | | 37 |
| | | | 36 |
| | | | 37 |
| | | | 40 |
| | | | 42 |
| | | | 46 |

* Start Time (L_{eq} Start)

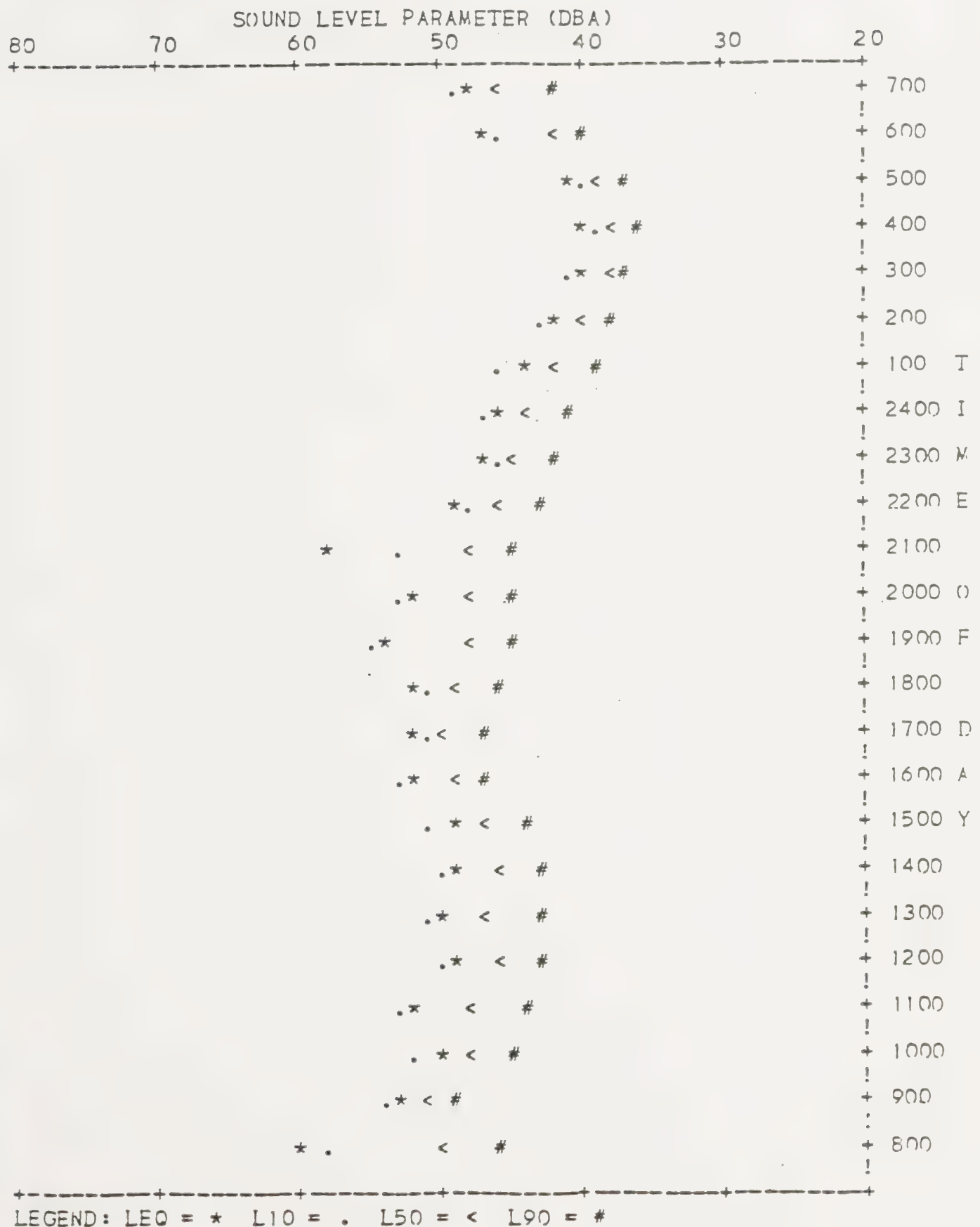
24-Hour L_{eq} - 52

Day L_{eq} - 53

Night L_{eq} - 45

HAMILTON TRANSPORTATION CORRIDOR

SITE NO:8 1980 05 22/23



HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|---|---------------------------------|--------|------|----------|-----------|-------|
| Site No. | Location | | | | | |
| 9 | 64 Forest Hill Cres., rear yard | | | | | |
| Dates | | | | | | |
| 1980 06 23/24 | | | | | | |
| Start Time | Weather at 12:00 1980 06 24 | | | | | |
| 14:30 | | Wind | | | | |
| Stop Time | Temp. | Speed | Dir. | Humidity | Pressure | Sky |
| 16:00 | 26°C | 6 km/h | SW | 61% | 101.8 kPa | Clear |
| Inhibit Duration | | | | | | |
| None | | | | | | |
| Primary Noise Sources - Neighbourhood activities From 12:30 to 14:30 the owner repaired a concrete walk in the rear yard, utilizing a concrete drill. | | | | | | |
| Comments Area - Residential. E/W & N/S transportation corridor immediately to the west. | | | | | | |

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDOR

ENVIRONMENTAL NOISE STUDY

| TIME | 24 h Measurements | | |
|-------------|-------------------|-----------------|-----------------|
| | L _{eq} | L ₁₀ | L ₅₀ |
| 07:00-08:00 | 44 | 45 | 43 |
| 08:00-09:00 | 48 | 47 | 44 |
| 09:00-10:00 | 43 | 44 | 41 |
| 10:00-11:00 | 42 | 41 | 37 |
| 11:00-12:00 | 45 | 45 | 39 |
| 12:00-13:00 | 48 | 44 | 38 |
| 13:00-14:00 | 65 | 70 | 44 |
| 14:00-15:00 | 58 | 46 | 40 |
| 15:00-16:00 | 46 | 47 | 42 |
| 16:00-17:00 | 46 | 47 | 43 |
| 17:00-18:00 | 49 | 48 | 44 |
| 18:00-19:00 | 49 | 46 | 41 |
| 19:00-20:00 | 44 | 46 | 40 |
| 20:00-21:00 | 51 | 55 | 41 |
| 21:00-22:00 | 44 | 45 | 39 |
| 22:00-23:00 | 45 | 45 | 41 |
| 23:00-24:00 | 43 | 44 | 41 |
| 24:00-01:00 | 46 | 43 | 40 |
| 01:00-02:00 | 40 | 40 | 38 |
| 02:00-03:00 | 39 | 40 | 36 |
| 03:00-04:00 | 41 | 42 | 36 |
| 04:00-05:00 | 41 | 42 | 38 |
| 05:00-06:00 | 50 | 48 | 37 |
| 06:00-07:00 | 48 | 48 | 36 |
| | | | 36 |

*

* Start Time (deduct 30 min.)

24-Hour L_{eq} - 53Day L_{eq} - 54Night L_{eq} - 45

HAMILTON TRANSPORTATION CORRIDOR

SITE NO:9 1980 06 23/24

SOUND LEVEL PARAMETER (DBA)

| 80 | 70 | 60 | 50 | 40 | 30 | 20 |
|--|-----|-----|-----|---------|----|-----------|
| +-----+-----+-----+-----+-----+-----+----- | | | | | | |
| | | | *. | < # | | + 700 |
| | | | * . | < # | | + 600 |
| | | | | . * < # | | + 500 |
| | | | | . * < # | | + 400 |
| | | | | . * < # | | + 300 |
| | | | | * . < # | | + 200 |
| | | | * . | < # | | + 100 T |
| | | | | . * < # | | + 2400 I |
| | | | * . | < # | | + 2300 M |
| | | | . * | < # | | + 2200 E |
| | | . * | | < # | | + 2100 |
| | | | . * | < # | | + 2000 () |
| | | | * . | < # | | + 1900 F |
| | | | * . | < # | | + 1800 |
| | | | . * | < # | | + 1700 D |
| | | | . * | < # | | + 1600 A |
| | | * | . * | < # | | + 1500 Y |
| | . * | | | < # | | + 1400 |
| | | | * . | < # | | + 1300 |
| | | | * . | < # | | + 1200 |
| | | | | * . < # | | + 1100 |
| | | | | . * < # | | + 1000 |
| | | | * . | < # | | + 900 |
| | | | | . * < # | | + 800 |
| +-----+-----+-----+-----+-----+-----+----- | | | | | | |

LEGEND: LEQ = * L10 = . L50 = < L90 = #

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|--|--|---------|----|----------|-----------|--------|
| Site No. 10 | Location 21 Beland Court, rear yard | | | | | |
| Dates 1980 07 03/04 | | | | | | |
| Start Time 16:42 | Weather at 17:00 1980 07 04 | | | | | |
| Stop Time 17:15 | Temp. | Wind | | Humidity | Pressure | Sky |
| Inhibit Duration None | Speed | Dir. | | | | |
| | 27°C | 11 km/h | SW | 51% | 101.6 kPa | Broken |
| Primary Noise Sources - King St. traffic - Trail bike activity in valley - Neighbourhood activities - Mowing lawn at 11:00-12:00 (83 dBA, L_{eq}) | | | | | | |
| Comments Area - Residential. E/W and N/S transportation corridor immediately to the south, east and west. | | | | | | |

SITE NO:10 1980 07 03/04

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDOR

ENVIRONMENTAL NOISE STUDY

| TIME | 24 h Measurements | | |
|--------------|-------------------|-----------------|-----------------|
| | L _{eq} | L ₁₀ | L ₅₀ |
| 07:00-08:00 | 55 | 56 | 49 |
| 08:00-09:00 | 51 | 51 | 48 |
| 09:00-10:00 | 50 | 51 | 48 |
| 10:00-11:00 | 50 | 50 | 47 |
| 11:00-12:00 | 83 (50) | (1) 53 | 49 |
| 12:00-13:00 | 50 | 50 | 47 |
| 13:00-14:00 | 52 | 53 | 51 |
| 14:00-15:00 | 53 | 54 | 52 |
| 15:00-16:00 | 54 | 54 | 52 |
| 16:00-17:00 | 54 | 54 | 53 |
| *17:00-18:00 | 50 | 50 | 47 |
| 18:00-19:00 | 52 | 50 | 47 |
| 19:00-20:00 | 51 | 48 | 45 |
| 20:00-21:00 | 80 (51) | (1) 52 | 46 |
| 21:00-22:00 | 50 | 49 | 46 |
| 22:00-23:00 | 48 | 49 | 46 |
| 23:00-24:00 | 49 | 49 | 46 |
| 24:00-01:00 | 49 | 49 | 46 |
| 01:00-02:00 | 46 | 47 | 43 |
| 02:00-03:00 | 43 | 45 | 40 |
| 03:00-04:00 | 59 | 54 | 39 |
| 04:00-05:00 | 39 | 40 | 37 |
| 05:00-06:00 | 43 | 44 | 40 |
| 06:00-07:00 | 51 | 51 | 47 |

* Start Time (Deduct 18 min.) (L_{eq24} calculated utilizing (L_{eqh})⁽¹⁾).

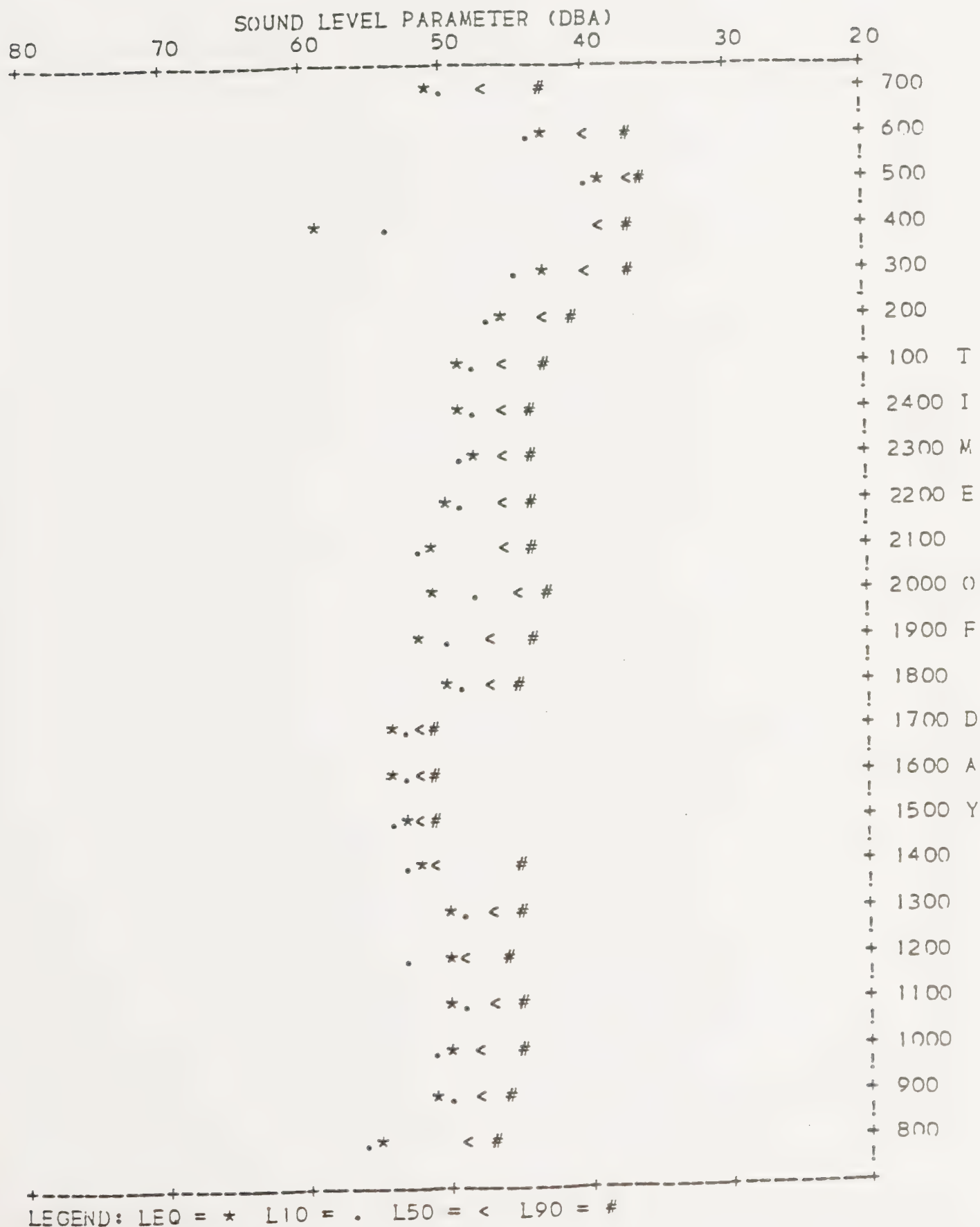
24-Hour L_{eq} - 52 High level transient events occurred during these hours, which would not reflect normal ambient.

Day L_{eq} - 52

Night L_{eq} - 52

HAMILTON TRANSPORTATION CORRIDOR

SITE NO: 10 1980 07 03/04



HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|--|-------------------------------------|---------|------|----------|----------|--------|
| Site No. 11 | Location 3 Cherry Rd., rear yard | | | | | |
| Dates 1980 06 11/12 | | | | | | |
| Start Time 11:15 | Weather at 09:00 1980 06 11 | | | | | |
| Stop Time 11:20 | Temp. | Wind | | Humidity | Pressure | Sky |
| Inhibit Duration None | | Speed | Dir. | | | |
| | 15°C | 15 km/h | W | 48% | 102.8Kpa | Broken |
| Primary Noise Sources - Queenston Rd. traffic - Children playing | | | | | | |
| Comments Area - Residential. Red Hill Creek Valley immediately west - depressed considerably. | | | | | | |

SITE NO: 11 1980 06 11/12

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDOR

ENVIRONMENTAL NOISE STUDY

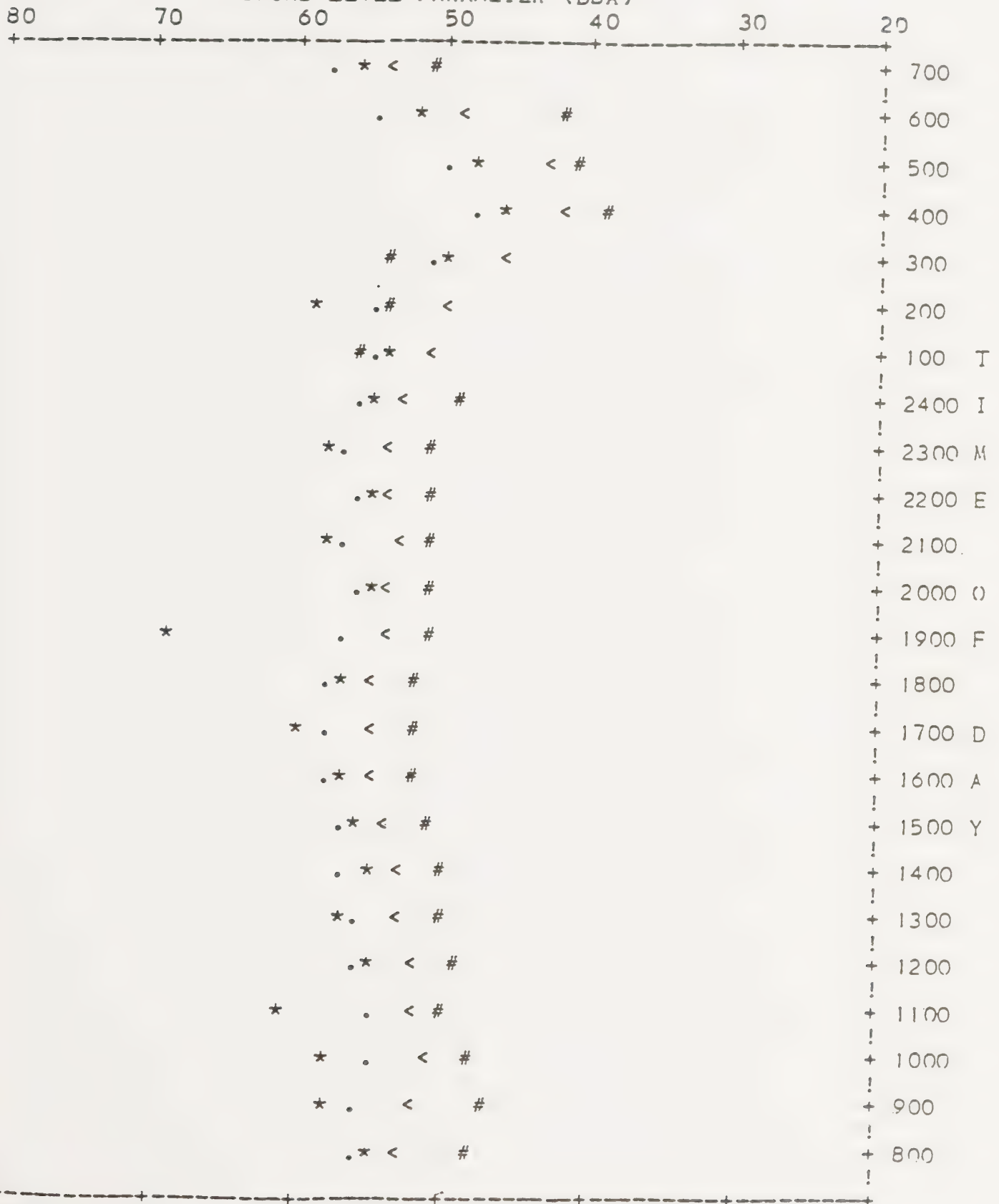
| TIME | 24 h Measurements | | |
|--------------|-------------------|-----------------|-----------------|
| | L _{eq} | L ₁₀ | L ₅₀ |
| 07:00-08:00 | 55 | 56 | 53 |
| 08:00-09:00 | 58 | 56 | 52 |
| 09:00-10:00 | 58 | 55 | 51 |
| 10:00-11:00 | 61 | 55 | 52 |
| *11:00-12:00 | 55 | 56 | 52 |
| 12:00-13:00 | 57 | 56 | 53 |
| 13:00-14:00 | 55 | 57 | 53 |
| 14:00-15:00 | 56 | 57 | 54 |
| 15:00-16:00 | 57 | 58 | 55 |
| 16:00-17:00 | 60 | 58 | 55 |
| 17:00-18:00 | 57 | 58 | 55 |
| 18:00-19:00 | 69 | 57 | 54 |
| 19:00-20:00 | 55 | 56 | 54 |
| 20:00-21:00 | 58 | 57 | 53 |
| 21:00-22:00 | 55 | 56 | 54 |
| 22:00-23:00 | 58 | 57 | 54 |
| 23:00-24:00 | 55 | 56 | 53 |
| 24:00-01:00 | 54 | 55 | 51 |
| 01:00-02:00 | 59 | 55 | 50 |
| 02:00-03:00 | 50 | 51 | 46 |
| 03:00-04:00 | 46 | 48 | 42 |
| 04:00-05:00 | 48 | 50 | 43 |
| 05:00-06:00 | 52 | 55 | 49 |
| 06:00-07:00 | 56 | 58 | 54 |

* Start Time
24-Hour L_{eq} - 59
Day L_{eq} - 60
Night L_{eq} - 54

HAMILTON TRANSPORTATION CORRIDOR

SITE NO: 11 1980 06 .11/12

SOUND LEVEL PARAMETER (DBA)



LEGEND: LEQ = * L10 = . L50 = < L90 = #

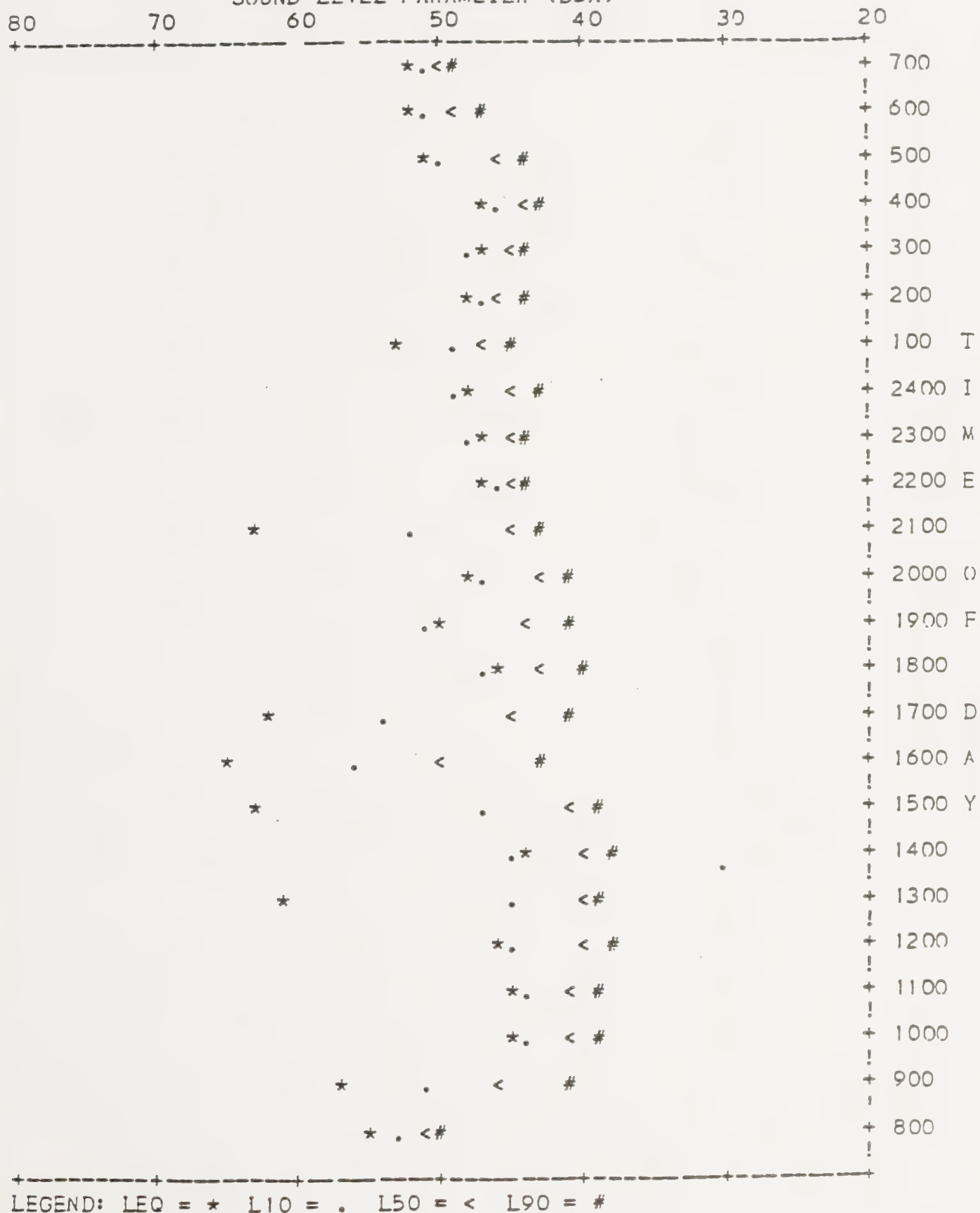
HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|--|---|--------|------|----------|-----------|-------|
| Site No. 12 | Location 255 Pottruff Rd., rear yard | | | | | |
| Dates 1980 06 24/25 | | | | | | |
| Start Time 17:45 | Weather at 12:00 1980 06 25 | | | | | |
| | | Wind | | | | |
| Stop Time 20:00 | Temp. | Speed | Dir. | Humidity | Pressure | Sky |
| Inhibit Duration None | 27°C | 9 km/h | SW | 62% | 101.7 kPa | Clear |
| Primary Noise Sources - Neighbourhood activities, dogs, children - Pottruff Rd. traffic - Neighbour's Hi-Fi at 14:45 to 17:45 (approximately) | | | | | | |
| Comments Area - Residential. E/W & N/S transportation corridor immediately West. | | | | | | |

HAMILTON TRANSPORTATION CORRIDOR

SITE NO: 12 1980 06 24/25

SOUND LEVEL PARAMETER (DBA)



HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|--|---|---------|------|----------|-----------|-------|
| Site No. 13 | Location 350 Pottruff Rd., rear yard | | | | | |
| Dates 1980 07 02/03 | | | | | | |
| Start Time 14:00 | Weather at 10:00 1980 07 03 | | | | | |
| | | Wind | | | | |
| Stop Time 15:10 | Temp. | Speed | Dir. | Humidity | Pressure | Sky |
| Inhibit Duration None | 18°C | k3 km/h | NE | 56% | 101.7 kPa | Clear |
| Primary Noise Sources - Barton Street traffic - Nash Road traffic - Pottruff Rd. traffic - Neighbourhood activities | | | | | | |
| Comments Area - Residential to the east and south. Industrial and commercial to the north beyond Burton Street. E/W and N/S transportation to the west beyond Pottruff Road. Nursery school immediately east of measurement location. | | | | | | |

SITE NO: 13 1980 07 03

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDOR

ENVIRONMENTAL NOISE STUDY

| TIME | 24 h Measurements | | |
|--------------|-------------------|-----------------|-----------------|
| | L _{eq} | L ₁₀ | L ₅₀ |
| 07:00-08:00 | 55 | 55 | 51 |
| 08:00-09:00 | 54 | 55 | 50 |
| 09:00-10:00 | 54 | 55 | 50 |
| 10:00-11:00 | 58 | 59 | 51 |
| 11:00-12:00 | 65 | 69 | 54 |
| 12:00-13:00 | 53 | 54 | 50 |
| 13:00-14:00 | 53 | 54 | 50 |
| *14:00-15:00 | 53 | 54 | 50 |
| 15:00-16:00 | 58 | 60 | 53 |
| 16:00-17:00 | 57 | 57 | 52 |
| 17:00-18:00 | 61 | 65 | 52 |
| 18:00-19:00 | 53 | 54 | 50 |
| 19:00-20:00 | 56 | 58 | 51 |
| 20:00-21:00 | 56 | 56 | 50 |
| 21:00-22:00 | 54 | 52 | 47 |
| 22:00-23:00 | 51 | 52 | 48 |
| 23:00-24:00 | 52 | 52 | 49 |
| 24:00-01:00 | 49 | 51 | 46 |
| 01:00-02:00 | 48 | 49 | 45 |
| 02:00-03:00 | 49 | 50 | 47 |
| 03:00-04:00 | 48 | 50 | 46 |
| 04:00-05:00 | 50 | 51 | 48 |
| 05:00-06:00 | 50 | 52 | 48 |
| 06:00-07:00 | 53 | 54 | 51 |

* Start Time

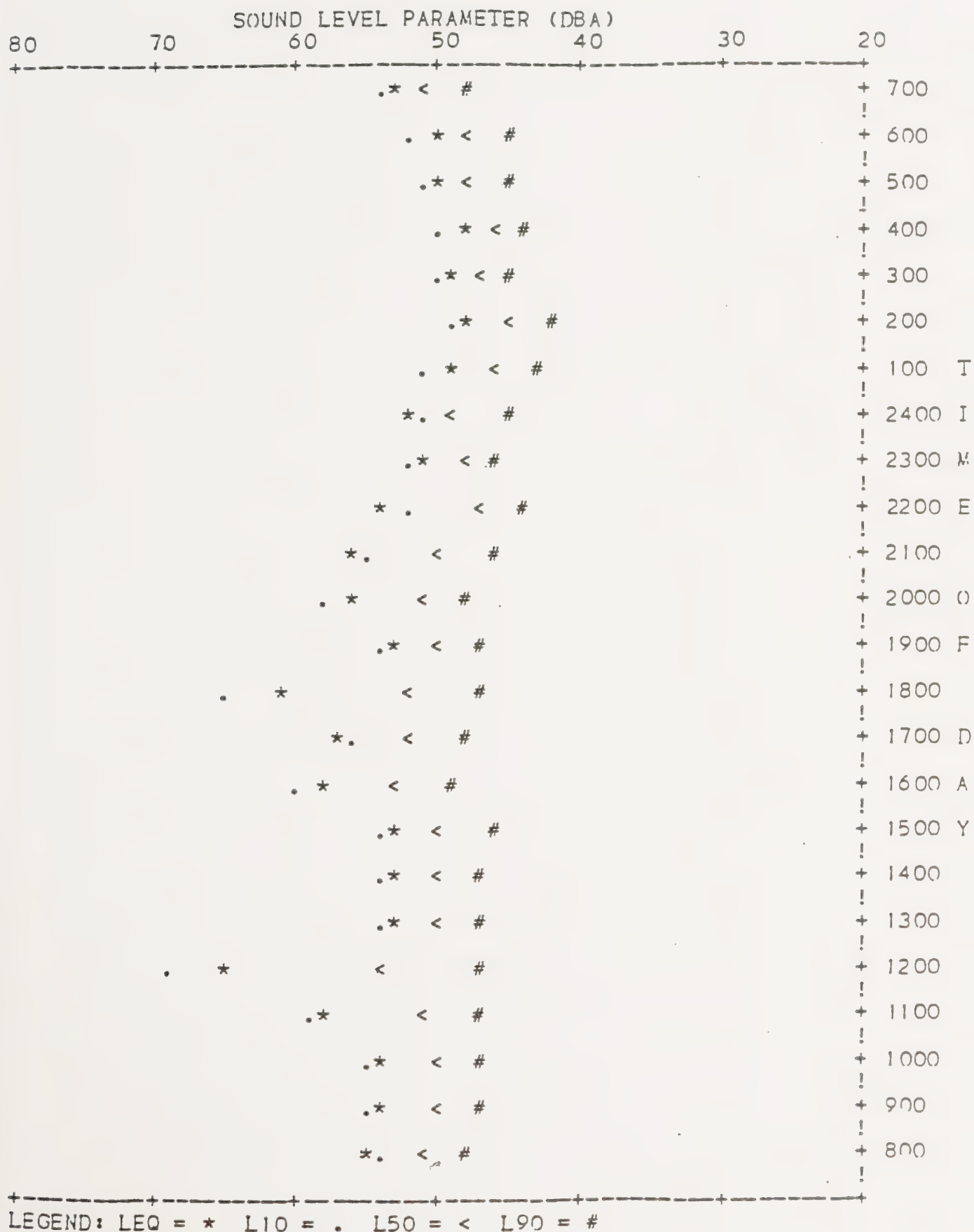
24-Hour L_{eq} - 56

Day L_{eq} - 58

Night L_{eq} - 50

HAMILTON TRANSPORTATION CORRIDOR

SITE NO:13 1980 07 03



HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|---|--|---------|------|----------|-----------|--------|
| Site No. 14 | Location 21 Embury Court, rear yard | | | | | |
| Dates 1980 06 30 1980 07 01 | | | | | | |
| Start Time 13:07 | Weather at 10:00 1980 07 01 | | | | | |
| | | Wind | | | | |
| Stop Time 13:12 | Temp. | Speed | Dir. | Humidity | Pressure | Sky |
| Inhibit Duration 2 min. | 20°C | 19 km/h | SW | 78% | 101.7 kPa | Broken |
| Primary Noise Sources - C.N. Rail - Neighbourhood activities | | | | | | |
| Comments Area - Residential to the south and east. C.N. Rail immediately north. E/W and N/S transportation corridor to the east. | | | | | | |

SITE NO: 14 1980 06 30/1980 07 01

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY

| TIME | 24 h Measurements | | |
|-------------|-------------------|----------|----------|
| | L_{eq} | L_{10} | L_{50} |
| 07:00-08:00 | 55 | 46 | 44 |
| 08:00-09:00 | 49 | 47 | 42 |
| 09:00-10:00 | 49 | 48 | 43 |
| 10:00-11:00 | 63 | 47 | 44 |
| 11:00-12:00 | 47 | 48 | 43 |
| 12:00-13:00 | 58 | 46 | 43 |
| 13:00-14:00 | 55 | 52 | 47 |
| 14:00-15:00 | 63 | 60 | 46 |
| 15:00-16:00 | 66 | 60 | 49 |
| 16:00-17:00 | 50 | 49 | 45 |
| 17:00-18:00 | 66 | 54 | 45 |
| 18:00-19:00 | 67 | 60 | 47 |
| 19:00-20:00 | 64 | 63 | 50 |
| 20:00-21:00 | 58 | 61 | 48 |
| 21:00-22:00 | 53 | 53 | 47 |
| 22:00-23:00 | 68 | 49 | 45 |
| 23:00-24:00 | 68 | 46 | 44 |
| 24:00-01:00 | 59 | 46 | 44 |
| 01:00-02:00 | 64 | 46 | 43 |
| 02:00-03:00 | 46 | 47 | 45 |
| 03:00-04:00 | 48 | 48 | 47 |
| 04:00-05:00 | 52 | 51 | 48 |
| 05:00-06:00 | 63 | 51 | 49 |
| 06:00-07:00 | 49 | 49 | 47 |
| | | | L_{90} |
| | | | 42 |
| | | | 40 |
| | | | 41 |
| | | | 42 |
| | | | 41 |
| | | | 41 |
| | | | 45 |
| | | | 43 |
| | | | 45 |
| | | | 43 |
| | | | 42 |
| | | | 43 |
| | | | 46 |
| | | | 45 |
| | | | 45 |
| | | | 44 |
| | | | 42 |
| | | | 42 |
| | | | 42 |
| | | | 43 |
| | | | 45 |
| | | | 47 |
| | | | 47 |
| | | | 45 |

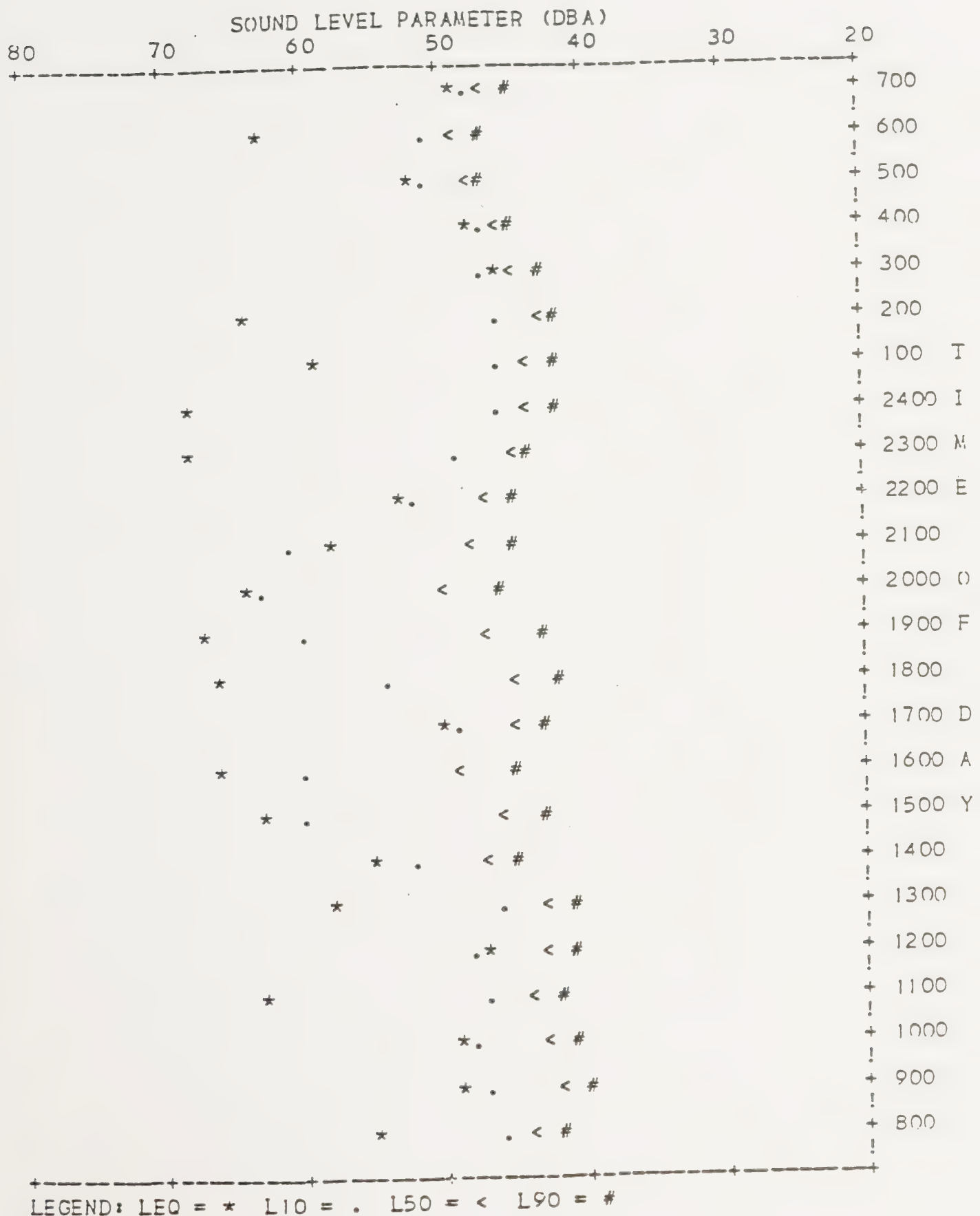
*

* Start Time (add 07 min.)

24-Hour L_{eq} - 62Day L_{eq} - 63Night L_{eq} - 62

HAMILTON TRANSPORTATION CORRIDOR

SITE NO:14 1980 06 30/1980 07 01



HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY24 h MEASUREMENTS SITE DATA

| | | | | | | |
|---|--|--------------------|----|----------|-----------|----------|
| Site No. 15. | Location 36 Sinclair Court, rear yard | | | | | |
| Dates 1980 07 08/09 | | | | | | |
| Start Time 11:16 | Weather at 13:45 1980 07 09 | | | | | |
| Stop Time 13:18 | Temp. | Wind Speed Dir. | | Humidity | Pressure | Sky |
| Inhibit Duration 2 min. | 23°C | 15 km/h | SW | 65% | 101.6 kPa | Overcast |
| Primary Noise Sources - Lawrence Rd. traffic - T.H. & B. rail road - King St. traffic | | | | | | |
| Comments Area - Residential to the west and north. E/W and N/S transportation corridor immediately east. | | | | | | |

SITE NO: 15 1980 07 08/09

HAMILTON EAST-WEST AND NORTH-SOUTH TRANSPORTATION CORRIDORENVIRONMENTAL NOISE STUDY

| TIME | 24 h Measurements | | |
|-------------|-------------------|-----------------|-----------------|
| | L _{eq} | L ₁₀ | L ₅₀ |
| 07:00-08:00 | 54 | 54 | 52 |
| 08:00-09:00 | 52 | 53 | 49 |
| 09:00-10:00 | 50 | 51 | 47 |
| 10:00-11:00 | 54 | 53 | 47 |
| 11:00-12:00 | 51 | 52 | 48 |
| 12:00-13:00 | 54 | 55 | 50 |
| 13:00-14:00 | 52 | 53 | 49 |
| 14:00-15:00 | 51 | 53 | 49 |
| 15:00-16:00 | 52 | 53 | 50 |
| 16:00-17:00 | 53 | 53 | 50 |
| 17:00-18:00 | 51 | 52 | 50 |
| 18:00-19:00 | 51 | 52 | 49 |
| 19:00-20:00 | 51 | 51 | 48 |
| 20:00-21:00 | 51 | 51 | 48 |
| 21:00-22:00 | 49 | 50 | 47 |
| 22:00-23:00 | 47 | 49 | 45 |
| 23:00-24:00 | 50 | 47 | 44 |
| 24:00-01:00 | 52 | 47 | 43 |
| 01:00-02:00 | 48 | 48 | 47 |
| 02:00-03:00 | 49 | 50 | 48 |
| 03:00-04:00 | 49 | 59 | 48 |
| 04:00-05:00 | 49 | 50 | 48 |
| 05:00-06:00 | 51 | 51 | 49 |
| 06:00-07:00 | 60 | 54 | 52 |
| | | | 50 |
| | | | 47 |
| | | | 46 |
| | | | 46 |
| | | | 44 |
| | | | 44 |
| | | | 46 |
| | | | 47 |
| | | | 47 |
| | | | 46 |
| | | | 49 |
| | | | 48 |
| | | | 47 |
| | | | 46 |
| | | | 43 |
| | | | 41 |
| | | | 40 |
| | | | 45 |
| | | | 46 |
| | | | 47 |
| | | | 50 |
| | | | 52 |

* Start Time (Add 16 min.)

24-Hour L_{eq} - 52Day L_{eq} - 52Night L_{eq} - 53

HAMILTON TRANSPORTATION CORRIDOR

SITE NO:15 1980 07 08/09

SOUND LEVEL PARAMETER (DBA)

| 80 | 70 | 60 | 50 | 40 | 30 | 20 |
|----|----|----|----|----|----|-----------|
| | | * | . | < | # | + 700 |
| | | | * | . | < | + 600 |
| | | | . | * | < | + 500 |
| | | . | * | < | # | + 400 |
| | | | . | * | < | + 300 |
| | | | * | . | < | + 200 |
| | | | * | . | < | + 100 T |
| | | | * | . | < | + 2400 I |
| | | | . | * | < | + 2300 M |
| | | | . | * | < | + 2200 E |
| | | | * | . | < | + 2100 |
| | | | * | . | < | + 2000 () |
| | | | . | * | < | + 1900 F |
| | | | . | * | < | + 1800 |
| | | | * | . | < | + 1700 D |
| | | | . | * | < | + 1600 A |
| | | | . | * | < | + 1500 Y |
| | | | . | * | < | + 1400 |
| | | | . | * | < | + 1300 |
| | | | . | * | < | + 1200 |
| | | | * | . | < | + 1100 |
| | | | . | * | < | + 1000 |
| | | | . | * | < | + 900 |
| | | | * | . | < | + 800 |

LEGEND: LEQ = * L10 = . L50 = < L90 = #



Rowan Williams Davies & Irwin Inc.

Consulting Engineers
650 Woodlawn Road West
Guelph, Ontario
Canada N1K 1B8

Tel: (519) 823-1311
Fax: (519) 823-1316
Email: info@rwdi.com
Website: <http://www.rwdi.com>